

PROCEEDINGS
OF THE
LINNEAN SOCIETY OF LONDON.



135TH SESSION.

FROM NOVEMBER 1922 TO JUNE 1923.

LONDON:
PRINTED FOR THE LINNEAN SOCIETY,
BURLINGTON HOUSE, PICCADILLY, W.1.
1923.

CONTENTS.

	Page
List of Publications issued	iv
Proceedings of the 135th Session	i
Presidential Address	27
Obituaries	36
Abstracts	51
Benefactions, 1904-1923	69
Additions to the Library	73
Index	78

PUBLICATIONS: SESSION JULY 1922-JUNE 1923.

Journal, Botany.

Vol. XLVI.	No. 306.	10/-
	„ 307.	18/-
	„ 308.	12/-

Journal, Zoology.

Vol. XXXV.	No. 232.	10/-
	„ 233.	10/-
	„ 234.	10/-
	„ 235.	12/-

Proceedings, 134th Session, November 1922. 6/-

List of [Fellows, Associates, and Foreign Members], Nov. 1922.

PROCEEDINGS
OF THE
LINNEAN SOCIETY OF LONDON.

(ONE HUNDRED AND THIRTY-FIFTH SESSION,
1922-1923.)

November 2nd, 1922.

Dr. A. SMITH WOODWARD, F.R.S., President,
in the Chair.

The Minutes of the General Meeting of the 15th June, 1922,
were read and confirmed.

A special vote of thanks was passed by acclamation to Dr. W. RUSHTON PARKER for his gifts of the last edition (11th) of 'The Encyclopædia Britannica,' 32 quarto vols. on thin paper, and case; the 'New Oxford Dictionary,' complete to date, with shelves to accommodate the set; Sonnini's edition of Buffon's 'Histoire Naturelle,' 127 vols., with six vols. of 'Suites à Buffon'; and 106 additional portraits of naturalists and patrons of botany.

Mr. Reginald Cory, Mr. Harry Bertram Harding, and Mr. Hugh Vandevaes Lely were admitted Fellows.

The certificate in favour of Mr. William Henry Wilkins was read for the second time.

The following were proposed as Fellows:—

Miss Annie Dixon, F.R.M.S.; Joseph Bunny; Zenon Ioannon Solomides; Miss Elizabeth Marianne Blackwell; Miss Helena Bandulska, M.Sc.; Robert Edward Chapman; and George Allan Frost.

The President gave notice that a Ballot for Fellows would take place on the 14th December next; he also announced that two vacancies now exist for Associates, due to the deaths of Robert Allen Rolfe and William Cole.

The President read the following proposed alterations in the Bye-Laws:—

Chap. VIII. Sect. 1 (p. 21). To omit the following: "and each Anniversary Meeting shall also be advertised in Two or more of the Public Newspapers, at least one week before the same takes place."

(Now needless, as every Fellow has notice.)

Chap. VIII. Sect. 4 (p. 22). For "Three o'clock" substitute "Five o'clock"; for "Half-past Three o'clock" substitute "Half-past Five o'clock"; and for "Four o'clock" substitute "Six o'clock."

(Thus altering the hour of meeting from 3 to 5 P.M.)

Chap. X. Sect. 8 (p. 24). After "Iron Chest," insert "or with the Society's Bankers, and the Iron Chest shall".

(Giving power to lodge securities at the Bank.)

The first communication was by Dr. A. B. RENDLE, F.R.S., Sec.L.S., on "Early specimens of *Dahlia* and *Chrysanthemum* from the Banksian Herbarium," illustrated by lantern-slides.

Mr. J. BRITTEN contributed a few additional remarks.

Dr. RENDLE also showed on behalf of Mr. ALFRED O. WALKER, F.L.S., a vine-tendrill bearing a ripe grape, and explained the relation of tendrils to inflorescence in the vine.

The meeting sent its best wishes to our veteran Fellow, now entering his 91st year.

Mr. JULIAN S. HUXLEY then gave his paper on "The Courtship of Birds," with slides from his own drawings and other sources in illustration; it was communicated by Prof. E. S. Goodrich, F.R.S., Sec.L.S.

A discussion followed, in which the President, Mr. W. P. Pycraft, A.L.S., and Lt.-Col. J. H. Tull Walsh engaged, the author replying.

Dr. B. DAYDON JACKSON, Gen.Sec.L.S., then made a short statement concerning the use of the name *Forstera* or *Forsteria*, both used by Linné in his herbarium with his note *Forstera vaginalis*, on a sheet which formerly had a grass-like plant glued upon it, and therefore was widely separated from the Stylidiaceous genus which at the present day bears the name *Forstera*. Further doubts as to the respective shares of SPARRMAN, G. FORSTER, and LINN. f. were raised by statements published by Linn. f. and the Forsters.

November 16th, 1922.

Dr. A. SMITH WOODWARD, F.R.S., President,
in the Chair.

The Minutes of the General Meeting of the 2nd November, 1922, were read and confirmed.

Mr. Robert Gurney, M.A., F.Z.S., M.B.O.U., was admitted a Fellow.

The Certificates in favour of the following were read for the second time:—

Miss Annie Dixon, F.R.M.S.; Joseph Bunny; Zenon Ioannon Solomides; Miss Elizabeth Marianne Blackwell, M.Sc. (Liverpool); Miss Helena Bandulska, M.Sc.; Robert Edward Chapman, M.Sc. (Leeds); and George Allan Frost, F.G.S.

The following were proposed as Fellows:—

Frederick Tom Brooks, M.A. (Cantab.); Robert McGillivray; George Norman Bunyard; and Montagu Charles Allwood, F.R.H.S.

The President read the proposed alterations in the Bye-Laws, as announced on the 2nd November, for the second time.

The President also read a letter from Mr. A. O. WALKER, expressing his appreciation of the message sent to him from the last Meeting.

The first communication was by Mr. A. J. WILMOTT, B.A., F.L.S., entitled "*Orchis latifolia*, Linn. (Marsh Orchis) from the Island of Öland, Sweden obtained from the station in which it was found by Linnæus in 1741." The author, in the following abstract supplied by him, stated:—

It was pointed out that *O. latifolia*, L., 1753, was a general name for Marsh Orchids, but in 1755 this name was limited without varieties, and separated from *O. incarnata* and *O. sambucina*. The diagnosis is general, and comes from Linnæus's article in Act. Upsal. 1740, where it applies mainly to unspotted-leaved plants. The plant referred to as "it. oel. 48" was *O. sambucina*, but the "*O. palmata palustris non maculata*" of "it. oel. 48" was *prætermissa*. This is referred by Linnæus in MS. notes to Fl. Suec. (ed. 1) no. 728 var. (728 being referred to under *O. latifolia*), and is what remains when *O. sambucina* has been separated. The herbarium specimen is also *O. prætermissa*, matching one brought back by Mr. Edwards from the identical spot in Öland. The plant of the 'Hortus Cliffortianus' which

grew around Haarlem might possibly be *O. prætermissa*, but Linnæus said "Variat foliis maculatis & immaculatis," which indicates that hybrids with *O. maculata*, or perhaps *O. majalis*, were included. This was, however, his earliest work on the subject, being published in 1737 before he saw Vaillant's orchids or travelled in Öland. The Vaillant plant referred to, seen *in situ* by Linnæus in 1738, was the most common one round Paris with unspotted leaves: also probably *O. prætermissa*. Of the Bauhin plants, the "type" of 1753 and the var. β , which are respectively the var. *a* and "type" of his 1740 paper in Act. Upsal., are both unspotted-leaved plants, the "non maculata" and "latifolia" of the pre-Linnean authors; most likely both were forms of *O. prætermissa*. The var. ϵ of the 'Species Plantarum' was probably *O. majalis*, for the figure in Rudb. Elys. is good *majalis*. All of this indicates that by *O. latifolia* Linnæus had primarily in mind *O. prætermissa*. But Linnæus, in his description of 1755, says that the leaves are slightly spotted. This may refer to the decay spots on the plant in his herbarium, for this note was made when he described *O. incarnata* in the MS. notes in his copy of the 'Flora Suecica,' ed. 1, or it may refer to the hybrid forms with spotted leaves which occur where *O. prætermissa* and *O. maculata* occur together. The description of *O. incarnata* refers to the form so named by British botanists to-day. Linnæus knew *O. prætermissa*, and included it under n. 728 of Fl. Suec. ed. 1, which became *O. latifolia*. It seems fairly clear that by *O. latifolia* Linnæus in 1755 understood *O. prætermissa*, perhaps including the hybrid with *maculata*. Certainly he did not intend *O. majalis*, Reichb.

A discussion followed in which Mr. W. N. Edwards (visitor), Mr. C. C. Lacaita, Mr. T. A. Dymes, Mr. H. W. Pugsley, and Lord Rothschild engaged, the author replying.

Mr. T. A. SPRAGUE then gave a description, with a large number of specimens, of Twin-leaves and other abnormalities in the Common Ash, *Fraxinus excelsior*.

Specimens were shown of the following abnormalities:—

1. Fasciated stems, with dichotomous branching.
2. Bud-variation, with narrow caudate-acuminate leaflets.
3. Accessory leaflets; one or both leaflets of a pair replaced by sessile or stalked bifoliate pinnæ.
4. False accessory leaflets, by suppression of the internode above the lower pair of leaflets.
5. Confluent leaflets.
6. Twin-leaves and Triplets: occurring in various forms—Nature of leaf-twinning—Cause of this abnormality, probably hypertrophy—Significance of accessory and twin-leaves.
7. Anisophylly, the foliage leaf having a bud-scale as its nodal companion.
8. Suppression of a leaf: examples shown of complete or partial suppression of one leaf of a pair without disturbance of the opposite-decussate phyllotaxy, which continues as though the missing leaf were present.

Lt.-Col. J. H. Tull Walsh, Mr. J. W. Bodger, Dr. E. J. Salisbury, and Lord Rothschild discussed the paper, the last-named commenting on similar manifestations in *Pistacia Lentiscus*, the Terebinth, in certain parts of Algeria.

The last paper, by Dr. R. J. TILLYARD, on the wing-venation of the Order Plectoptera or May-flies, was postponed.

November 30th, 1922.

Dr. A. SMITH WOODWARD, F.R.S., President,
in the Chair.

The Minutes of the General Meeting of the 16th November, 1922, were read and confirmed.

Certificates in favour of the following were read for the second time :—

Frederick Tom Brooks, M.A. (Cantab.); Robert McGillivray; George Norman Bunyard; and Montagu Charles Allwood, F.R.H.S.

Charles Chubb, M.B.O.U., was proposed as an Associate.

The alterations in the Bye-laws, read from the Chair on the 2nd and 16th November, were balloted for and accepted.

Dr. A. B. RENDLE, F.R.S., Sec.L.S., exhibited a visitors' book, in use from 1778 to 1811, by Sir Joseph Banks, Bt., P.R.S., the weight of the visitors being noted. The book contains the names of many well-known botanists of the period and of other visitors to Banks's herbarium and library. Some of the entries are in Banks's hand, others are autograph; many are by Jonas Dryander, who was librarian to Banks from 1782 till his death in 1810. In several cases the same person is recorded at different dates, and the variation in weight is curious and interesting. Banks was weighed 13 times, his weight increasing from 13st. 10 lbs. to 16 st. on 14th April, 1811.

The General Secretary commented on two names mentioned by Dr. Rendle as occurring in the volume: (1) Sir Charles Blagden, a noted physician and close friend of Banks, appreciated also by Dr. Samuel Johnson, whose "Blagden, sir, is a delightful fellow" occurs in Boswell's 'Life of Johnson'; and (2) Prof. von Linné, who was Banks's guest in 1782, and was present when Solander was struck down by apoplexy in that year; the professor's weight was 12 st. 3 lbs., which shows that he was a bigger man than his father, the famous naturalist.

A paper by Dr. R. J. TILLYARD on "The Wing-venation of the Order Plectoptera or May-flies" was read in title by Prof. E. S. Goodrich, F.R.S., Sec.L.S.

The next paper, "The Structure of certain Palæozoic Dipnoi [Fishes]," by Prof. D. S. M. WATSON and Mr. E. L. GILL, communicated by Prof. E. S. Goodrich, F.R.S., Sec.L.S., was explained by Prof. WATSON, with the help of a series of lantern-slides.

The President, in commenting upon the value and interest of the paper, alluded to the Northumbrian coal-miner, Thomas Atthey, to whose care and assiduity the splendid collections at Newcastle-on-Tyne are so greatly indebted. Other speakers were Prof. Goodrich and Mr. J. R. Norman (visitor), to whom Prof. Watson replied.

The General Secretary exhibited a copy of a volume entitled 'The Giant Trees of Victoria,' by Mr. J. DUNCAN PEIRCE, C.E., an expert photographer, of which only 25 copies were printed; there are 8 plates, averaging 16 in. $\times$ 12 in. Mr. Peirce stated that the tallest trees grew in gullies between ridges, the greater moisture and abundance of leaf-mould conducing to their height, but the highest tree measured proved to be only 326 feet 1 inch.

Mr. G. W. E. LODER remarked that the height of the Australian *Eucalyptus* had probably been exaggerated and did not equal that of the American Big-trees, and Dr. RENDLE added further comments.

December 14th, 1922.

Dr. A. SMITH WOODWARD, F.R.S., President,
in the Chair.

The Minutes of the General Meeting of the 30th November, 1922, were read and confirmed.

Mr. Willis Openshaw Howarth, M.Sc., was admitted a Fellow.

John Roxbrough Norman and Major Robert Beresford Seymour Sewell, I.M.S., were proposed as Fellows.

Major Charles Hunter, M.Sc.(Durh.); William Nowell, D.I.C.; William Frederick Neville Greenwood; William Henry Wilkins; Miss Annie Dixon, M.Sc. (Manch.); Joseph Bunny; Prof. Zenon Ioannon Solomides; Miss Elizabeth Marianne Blackwell, M.Sc. (Liverp.); Miss Helena Bandulska, M.Sc.; Robert Edward Chapman, M.Sc. (Leeds); George Allan Frost, F.G.S.; Frederick Tom Brooks, M.A. (Cantab.); Robert McGillivray; George Norman Bunyard; and Montagu Charles Allwood, were elected Fellows.

Prof. POULTON, F.R.S., introduced an exhibition of coloured lantern-slides, showing a new discovery in Mimicry of South American Butterflies.

Mr. W. J. KAYE (visitor), Sir Sidney F. Harmer, and Lt.-Col. J. H. Tull Walsh took part in the discussion which followed.

Mr. W. O. HOWARTH then gave his paper "On the occurrence of *Festuca rubra* in Britain," illustrating it with dried specimens.

Mr. H. W. PUGSLEY exhibited a series of specimens of British species of *Calamintha*, including a species new to this country.

The involved nomenclature of the true *Calaminthas*, which were placed in the genus *Melissa* by Linnaeus, was first alluded to, and reasons given for treating the three recognised British species as *Calamintha ascendens*, Jord., *C. Nepeta*, Savi, and *C. sylvatica*, Bromfield. The new form, first found near Swanage, in Dorset, in 1900, and again in 1912, was identified with *C. bœtica*, Boiss. & Reut., although showing differences in minor features, which were attributed to climatic influence. The salient characters of *C. bœtica* were pointed out, and contrasted with those of the other British species, and the geographical distribution of the new plant indicated, with special reference to its interest as an additional unit in the Lusitanian element in the British Flora.

In the discussion which ensued, Mr. H. S. Thompson, Mr. T. A. Dymes, Mr. E. G. Baker, Mr. A. H. Maude, Mr. C. E. Salmon, and Mr. F. N. Williams engaged, and Mr. Pugsley replied.

Dr. LILY BATTEN then gave a condensed account of her paper:—"The Genus *Polysiphonia*; a critical revision of the British species, based upon anatomy." (Communicated by Prof. Dame Helen Gwynne-Vaughan, D.B.E., D.Sc., F.L.S.)

Dr. Marion Delf and Prof. Neilson Jones contributed additional remarks, and the author replied.

January 18th, 1923.

Dr. A. SMITH WOODWARD, F.R.S., President,
in the Chair.

The Minutes of the General Meeting of the 14th December, 1922, were read and confirmed.

Frederick Tom Brooks, M.A. (Cantab.); George Norman Bunyard; Miss Helena Bandulska, M.Sc.; Frederick Berry-Lewis Butler; and Joseph Bunny, were admitted Fellows.

Certificates in favour of John Roxbrough Norman and Major Robert Beresford Seymour Sewell were read for the second time.

Edward Arthur Wilson was proposed as a Fellow.

Charles Chubb was elected an Associate.

The President announced the death of Prof. GASTON EUGÈNE MARIE BONNIER, a Foreign Member: also that Ballots for Fellows will be taken on the 1st March and 3rd May.

Capt. G. H. WILKINS, introduced by Dr. A. B. RENDLE, F.R.S., Sec.L.S., exhibited a dried vegetable mass made from a variety of wild plants, *Chenopodium* and others, which are now an important element in the food-supply of the Russian peasantry; the plants are dried, pounded to a fine flour, and mixed with rye to make coarse cakes.

He then gave an account of the Shackleton-Rowett Expedition in the 'Quest' to the Antarctic Regions. On St. Paul's Rocks no plants save a few Algae were found, but at South Georgia, an island about 100 miles long and 20 miles broad, a considerable collection was made, though the flora is fairly well known, and reindeer thrive. Lichens and mosses only were observed on Elephant Island; Tristan da Cunha was visited and 16 species gathered. Gough Island is known from the 'Scotia' reports; the most conspicuous member of the flora is *Phylica arborea*, growing to 20 feet; a variety of *Sophora tetraptera* is now described. Tussock-grass, ferns and *Empetrum* grow luxuriantly, and an *Apium*, hitherto confused with congeners, is now described. The specimens have been presented to the British Museum by Mr. J. Q. Rowett. The lecture was illustrated by a series of fine lantern-slides.

A discussion followed in which the following engaged:—The President, Mr. H. N. Dixon, Mr. T. A. Dymes, Dr. A. B. Rendle, and Mr. C. C. Lacaita; Capt. Wilkins replying.

Mr. E. G. BAKER then followed with a resumé of the flora of Gough Island, 20 flowering plants and 10 ferns being now known from it. Amongst these may be named the endemic *Cotula goughensis* Rud. Br., *Hydrocotyle leucocephala* Cham. & Schlecht., *Gnaphalium pyramidale* Thouars, *Rumex frutescens* Thouars, and *Empetrum nigrum* L., var. *rubrum* Hemsl. The only small trees on the island are the *Phylica* and *Sophora* previously mentioned. There is also a new species of *Apium* allied to *A. australe* Thouars, but having broad cuneiform segments to the leaves. The widely-spread fern *Lomaria Boryana* Willd. reaches a height of from 2 to 3 feet.

Miss HELENA BANDULSKA, M.Sc., read her paper "The Cuticular Structure of certain Dicotyledonous and Coniferous Leaves from the Middle Eocene Flora of Bournemouth," illustrated by lantern-slides.

The President, Dr. Marie Stopes, Mr. W. N. Edwards (visitor), Dr. D. H. Scott, and Mr. H. W. Monckton contributed further observations, and the author replied.

Mr. W. R. SHERRIN showed a small volume containing small specimens of the entire moss-flora of Britain, as a *memoria technica*; also a similar volume, with species and varieties of *Sphagnum*. Dr. A. B. RENDLE and Mr. H. N. DIXON spoke on these exhibits, the latter producing a copy of W. G. MacIvor's 'Hepaticæ Britannicæ; or pocket Herbarium of British Hepaticæ,' New Brentford, 1847, containing 18 folios of specimens. The copy shown was remarkable for an inserted sheet of the alga *Thorva ramosissima* Bory: possibly the only British specimen extant.

February 1st, 1923.

Dr. A. SMITH WOODWARD, F.R.S., President,
in the Chair.

The Minutes of the General Meeting of the 18th January, 1923, were read and confirmed.

The certificate in favour of Edward Arthur Wilson was read for the second time.

The following were proposed as Fellows:—

Seevaratnam Arunachalam; Miss Ethel Katherine Pearce, F.E.S.; Edward Wyllie Fenton, M.A., B.Sc.(Aberd.), F.E.S.; and Prof. Robert Scott Troup, C.I.E., M.A.

Dr. A. B. RENDLE, F.R.S., Sec.L.S., exhibited a pocket dissecting microscope, which formerly belonged to Robert Brown, and gave its history. The General Secretary showed the larger instrument which had been presented to the Society twelve months previously; both instruments were provided with single lenses of high power.

Dr. ARTHUR W. HILL, F.R.S., then showed lantern-slides of photographs taken in the Tropical Fern House at Kew, exhibiting the special adaptation of certain species for their lower fronds intercepting débris washed down by rain, which was utilized by the plants.

Sir SIDNEY F. HARMER, K.B.E., F.R.S., F.L.S., then read his paper "On Cellularine and other Polyzoa," illustrated by drawings and lantern-slides. A discussion followed, the participants being the President, Dr. W. D. Lang (visitor), Prof. E. S. Goodrich, Prof. Garstang, and Dr. G. P. Bidder, the author briefly replying.

SIR NICOLAS YERMOLOFF, K.C.B., K.C.V.O., F.L.S., read his "Notes on *Chaetoceros* and allied genera, living and fossil," with lantern-slides, of which the following is an abstract:—

The Diatom genus *Chaetoceros* shows several peculiar features. It has been highly differentiated for pelagic life. It occurs in the planktons of the colder seas, sometimes, especially in spring, in colossal numbers. Some 100 living species have been described, but only 6 or 7 are common in the planktons.

The parent cells, each consisting of two valves with a hoop between them, form colonies, holding together by means of long setæ. The whole structure of the colony endows it with great floating capacity.

Two features of the genus are especially puzzling: one is that several of the species, though not all, have the capacity to develop inside the mother-cells peculiar internal organs, covered with a thick siliceous wall. These organs, rightly or wrongly, are called *statopores*. No one has ever seen them germinate, and whether they are organs of reproduction, or something like endocysts, or something else, is not known.

The other strange feature of the genus is, that although it is so infinitely numerous in the planktons, nevertheless the mother-cells, or colonies, as such, never appear in any fossil marine deposits. On the other hand, the spores do appear fairly often as fossil remains. Why it is that the vegetative form cannot stand fossilization whilst the spore can do so, is not known.

Although the spores of *Chaetoceros* are all built on very similar lines, yet the elder authors, since Ehrenberg, have taken them for separate Diatom genera, and have classified and named them as such. Thus some five new Diatom genera have been created. Of them, three (*Syndendrium* Ehr., *Dicludia* Ehr., and *Hercotheca* Ehr.) are undoubtedly spores of *Chaetoceros*. Two other genera (*Goniothecium* Ehr. and *Xanthiopyxis* Ehr.) may or may not be spores of *Chaetoceros*, or of some other form yet unknown.

Fossil spores of *Chaetoceros* are to be found frequently enough in Miocene Diatomaceous earths. The most common form is *Syndendrium* Ehr., which is the spore of *Chaetoceros diadema* Gran, very common in the planktons.

Dr. Clarence Tierney (visitor) contributed further remarks, and the author replied.

MR. HUBERT LYMAN CLARK'S paper, "Some Echinoderms from West Australia," communicated by Prof. W. J. Dakin, F.L.S., was, in the absence of the author, read in title.

MISS RATHBONE, F.L.S., brought for exhibition W. Gardiner's 'Musci britannici,' Glasgow, 1836, 8°, with specimens of the mosses; this seems to have been the earliest issue, followed afterwards by the Dundee and London editions.

Mr. CHARLES TURNER, F.L.S., sent a supply of microscope slides of Desmids from Wales, and *Cheetoceros* from Naples plankton, for distribution.

February 15th, 1923.

Dr. A. SMITH WOODWARD, F.R.S., President,
in the Chair.

The Minutes of the General Meeting of the 1st February, 1923, were read and confirmed.

Miss Elizabeth Marianne Blackwell, M.Sc. (Liverp.), was admitted a Fellow.

The certificates in favour of Seevaratnam Arunachalam, Miss Ethel Katherine Pearce, F.E.S., Edward Wyllie Fenton, M.A., B.Sc. (Aberd.), F.E.S., and Prof. Robert Scott Troup, C.I.E., M.A., were read for the second time.

Francis Miranda was proposed as a Fellow.

Dr. A. D. IMMS communicated and explained by the help of lantern-slides a paper by Mr. A. M. ALTSON, "On the method of oviposition and the egg of the Beetle *Lyctus brunneus*, Steph."

Prof. E. S. Goodrich, Sec.L.S., made a few additional remarks and Dr. Imms replied.

Mr. R. PAULSON exhibited 68 species in 27 genera of Lichens collected by Mr. V. S. Summerhayes, of the Oxford University Expedition to Spitsbergen in 1921. They were derived chiefly from Bear Island, a mass of limestone rock, and Prince Charles Foreland, of siliceous rock. The Gulf Stream influences both islands; most of the Lichens were thoroughly healthy, and had been carefully dried.

Miss A. Lorrain Smith and Dr. Rendle, Sec.L.S., contributed further remarks, and Mr. Paulson replied.

Mr. F. HOWARD LANCUM followed with the following account of curious oviposition by a specimen of the Clouded Yellow Butterfly, *Colias edusa*:—"I do not know that these few notes have any particular scientific value, but I think that the incident which they describe is sufficiently remarkable to be placed on record.

"In early September of last year I had seven captured female specimens of *Colias edusa*, which I kept for the purpose of obtaining ova. Of these, six duly deposited ova in fair numbers.

I had the seventh in confinement for a fortnight without result, the insect steadfastly refusing to lay, although I was convinced that it was fertile. As it also declined to feed, I had recourse to the usual practice in refractory cases of holding the insect by the wings, running out its proboscis on a fine needle, and allowing the end of the organ to rest on a pad of cotton wool which had previously been soaked in sugar water.

"Frequent repetition of this had the effect of rendering the insect quite tame. On the fifteenth day I was demonstrating this fact to a friend by introducing the tip of a finger, to which the insect would immediately cling. After one such occurrence I transferred the insect to a leaf of a potted plant of white clover, when to my surprise it laid an egg. I allowed it to remain for some minutes, and as nothing further happened I decided to repeat the experiment. I transferred the insect to another leaf of the same plant, and it again laid an egg. To cut the story short, I moved it seventeen times and obtained seventeen eggs, after which it refused to lay. So far as I am aware, this butterfly had not previously laid an egg, and never afterwards laid another. It died the following day.

"I can offer no explanation of this butterfly's refusal or inability to lay for the first fortnight. As a reason for its subsequent behaviour, I formed the opinion that, by the end of the fortnight, the insect was in a weak condition and rapidly failing, and having an instinctive knowledge of its approaching end was impelled to deposit its ova while there was yet time; no doubt the hustling it received assisted materially in this direction. I was assisted to this conclusion by the fact that, in one instance, the insect did not wait to be transferred to a leaf but actually attached an egg to my finger. A curious fact was that it would not deposit an egg until it was moved."

The Rev. Canon G. R. BULLOCK-WEBSTER showed a collection of thirty varieties of *Chara hispida*, explaining that in that genus varietal names are discarded, as the variation is so great and so frequent, that confusion would be the result, were it attempted.

The President and Dr. A. B. Rendle spoke on the interest of the exhibition, and Canon Bullock-Webster replied to questions.

The General Secretary exhibited a small volume, for which he had been searching for thirty-eight years, namely C. A. Agardh's 'Aphorismi botanici,' Lundæ, 1817-26, 8°, as confirming, in a striking degree, the practice prevalent in Scandinavia down to the middle of the previous century, the Præses being the actual author, and the Respondentes being little better than dummies. In this volume the text runs on, with 16 title-pages, having the names of as many graduates, interposed between each sheet of 16 pages, in no fewer than in twelve instances cutting a word in two and sharing it between two Respondentes.

The work is not in the library of the Linnean Society.

March 1st, 1923.

Dr. A. SMITH WOODWARD, F.R.S., President,
in the Chair.

The Minutes of the General Meeting of the 15th February, 1923, were read and confirmed.

Major Charles Hunter was admitted a Fellow.

The certificate in favour of Francis Miranda was read a second time.

The following were proposed as Fellows:—

Clarence Tierney, D.Sc.; The Rev. Francis Rosslyn Courtenay Bruce, D.D.; and Henry Harwood Smith; as Foreign Member, Dr. John Isaac Briquet, of Geneva; and as Associate, William Barclay.

The following were severally balloted for and elected Fellows:—

John Roxbrough Norman; Major Robert Beresford Seymour Sewell, I.M.S., B.A. (Cantab.); Edward Arthur Wilson; Seevaratnam Arunachalam; Miss Ethel Katherine Pearce, F.E.S.; Edward Wyllie Fenton, M.A., B.Sc. (Aberd.), F.E.S.; and Prof. Robert Scott Troup, C.I.E., M.A.

Mr. ASHLEY H. MAUDE gave an exhibition of about 300 specimens gathered from the South Tirol and the Dolomites, explaining those regions by various maps and photographs shown by the lantern.

Mr. J. N. HALBERT, M.R.I.A., contributed a paper, entitled "Notes on the Acari, with descriptions of new species," communicated by Dr. W. T. Calman, F.R.S., F.L.S., which was read in title.

Mr. C. F. M. SWYNNERTON exhibited a series of about sixty lantern-slides, illustrating various aspects of African woodland formations, displaying rain-forest, coppice, and thicket due to grass-fires, the means of prevention from injury by such fires, and the preservation of the forests by careful nurture.

The President stated that the lecture on "Botanic Illustration in Colour" announced for that evening had been postponed by the lecturer, to permit of the display of the series of slides just exhibited, as the author was starting on the 9th instant for East Africa to resume his duties as Game-warden.

March 15th, 1923.

Dr. A. SMITH WOODWARD, F.R.S., President,
in the Chair.

The Minutes of the General Meeting of the 1st March, 1923, were read and confirmed.

Mr. Edward Wyllie Fenton, M.A., B.Sc. (Aberd.), Mr. John Roxbrough Norman, Miss Annie Dixon, and Mr. Robert Edward Chapman, M.Sc., were admitted Fellows.

The following certificates were read for the second time: as Fellows, Dr. Clarence Tierney, The Rev. Francis Rosslyn Courtenay Bruce, D.D., and Mr. Henry Harwood Smith; as Associate, William Barclay; and as Foreign Member, Dr. John Isaac Briquet.

The following were proposed as Fellows:—

Mr. Robert Barr, Mr. Henry Charles Abraham, and Mr. William Plane Pycraft.

Mr. G. ALLAN FROST exhibited a large collection of the otoliths of recent fishes. The President remarked upon the extent and interest of the collection.

Mr. JOHN PARKIN brought forward a paper on "The Strobilus Theory of Angiospermous Descent." (See Abstract, p. 51.)

The discussion was carried on by Dr. D. H. Scott, Mr. H. H. Thomas (visitor), Prof. F. W. Oliver, and Dr. A. B. Rendle: reported in the Abstracts.

Mr. PARKIN briefly replied to the observations contributed by the speakers.

Dr. FRANCISCO FERRER (visitor) showed under the microscope slides illustrating the histology of Cœlenterates and Sponges, and drew attention to points of special interest.

Professor A. Dendy and Dr. G. P. Bidder contributed further remarks.

Mr. W. E. HOLLOWS sent from Exmouth specimens of *Ranunculus Ficaria* showing unusually bleached flowers.

April 19th, 1923.

Dr. A. SMITH WOODWARD, F.R.S., President,
in the Chair.

The Minutes of the General Meeting of the 15th March, 1923, were read and confirmed.

Mr. Robert McGillivray, Mr. Cecil Victor Boley Marquand, M.A. (Cantab.), Mr. Edward Arthur Wilson, Miss Ethel Katherine Pearce, F.E.S., and Mr. Frederick Albert Mitchell-Hedges, F.R.G.S., were admitted Fellows; and Mr. Charles Chubb, an Associate.

Certificates in favour of Robert Barr, Henry Charles Abraham, and William Plane Pycraft as Fellows were read for the second time.

The first communication appointed to be read was by Mr. EDWARD HERON-ALLEN, F.R.S., F.L.S., and Mr. ARTHUR EARLAND, F.R.M.S., on "The Foraminifera of Lord Howe Island, South Pacific," but in the absence of both authors reading was postponed until June 21.

Dr. RENDLE, F.R.S., Sec.L.S., with the aid of a lantern-slide, demonstrated the structure of the fruit of the Mare's-tail (*Hippuris vulgaris* Linn.). The figures and description of the fruit of this well-known British plant in the text-books and floras were unsatisfactory, and overlooked points of detail in structure associated with the germination of the seed. The fruit is a drupe, the upper portion of which around the persistent base of the style, with the seedcoat, is developed in the form of a stopper which is easily withdrawn on soaking the ripe fruit. The embryo ultimately fills the seed, and has the large radicle and hypocotyl so often found in water-plants. The speaker had been unable to get fruits of herbarium specimens several years old to germinate, and suggested that Fellows interested in British botany might look out for seedlings during the next season. The radicle was placed directly beneath the stopper which provided a place of exit on germination.

Dr. RENDLE also showed a three-flowered head of Daffodil, sent by Mr. Ernest Dixon, of Putney. Mr. Dixon mentioned that he was familiar with a double head but had never seen a triplet. Dr. Rendle pointed out that it was an instance of fasciation; the scape showing the characteristic broadened form. The three flowers were of slightly different age, and perfect.

Dr. B. DAYDON JACKSON, Gen. Sec., stated that rather more than three years ago he had given an account before the Society of the History of Botanic Illustration during Four Centuries, but in consequence of the difficulties of illustrating coloured plates by lantern-slides he had expressly excluded that section from his remarks. However, at the close of his lecture, he had been requested by more than one of the audience, to supplement his discourse by such account of colour applied to botanic plates as could be done without lantern-slides, to which he gladly assented, but until now he had been hindered from complying with the request.

Alluding to the methods of producing by printers' ink representations of plants in general, the speaker grouped the main methods into three: (1) where the design was in relief, and received the ink, which by pressure was transferred to paper, as in wood-engraving; (2) where the design was cut or bitten into a plate of metal, as copper-plate engraving, etching, mezzotint, &c.; (3) where the design did not differ much in level from the stone on which it was drawn, but depended upon the antagonism of grease and water, the stone receiving either and then refusing to receive the other. Examples were then shown of early herbals with artless colouring, most of them apparently due to the work of private possessors, but with later years, as in a copy of Fuchs's '*Stirpium historia*,' 1542, printed at Basel, the character of the work pointed to a trained colourist, such as Plantin of Antwerp employed at a later period.

During the prevalence of woodcuts in the early years of printing, copper-plate engraving began to make its way, and was employed in providing outlines for hand-colouring until the last century, when it was ousted by lithography. The method of printing from engraved plates was briefly described, and the application of mezzotint restricted to leaves and stems was pointed out, also Redouté's method of semi-stipple for coloured prints, each colour being separately applied to the plate and cleaned off, before finally heating the plate and pulling the print. A simpler method was also shown, where an ordinary engraving was printed in green ink, and other colours, as red or yellow, applied in water-colour.

After explaining how artistic use of pigments varied, and always must vary from theoretic statements as to primary colours, chromo-lithography was touched upon, and its greater permanence (if lasting colours are employed) to hand-coloured plates, some showing deterioration in less than a century, which was startling.

Next the three-colour process was touched upon, and the preparation of three (or four) half-tone blocks to print its own colour to be combined by the eye into a complete colour scheme. The weakness of the process lay in this, that it almost demanded a paper coated with baryta or china-clay, which could not be guaranteed as permanent: in addition was the temptation to use inks made from aniline dyes, which were fugitive.

Mr. FINDON asked if colour printing from wood blocks had been employed; the answer was the display of a Japanese catalogue of *Iris Kaempferi* in which that method was employed.

Mr. L. J. SEDGWICK inquired whether the three-coloured prints in Britton and Rose's "*Cactææ*" were produced by the "wavy line" process. The lecturer thought that the special effect was due to the use of miller's silk as a screen.

Mr. C. E. SALMON referred to Gerard's "Herball," of which certain copies were known to be coloured by hand, and if professional service was employed, the reply being in the negative.

Sir DAVID PRAIN instanced the case of Mr. Pantling in preparing coloured plates for his "Orchids of Sikkim," by training eight native boys to colour his special portion of each plate, the last touches being put in by the last boy, completing the colouring.

Mr. BAKER asked how Curtis's "Flora Londinensis" was coloured, the answer being it was like the 'Botanical Magazine,' done by hand.

Dr. RENDLE inquired whether entire editions, as of "Tragus" (shown), were coloured or only a few copies: the answer was that the larger number of copies known to the lecturer were uncoloured.

Several questions were put during the discourse by Lord Rothschild, Mr. Lester Garland, and Mr. A. W. Sheppard, which were replied to as they arose.

May 3rd, 1923.

Dr. A. SMITH WOODWARD, F.R.S., President,
in the Chair.

The Minutes of the General Meeting of the 19th April, 1923, were read and confirmed.

Miss Margery Knight, Miss Joan Beauchamp Procter, F.Z.S., Rev. William Charles Tippet, William Fawcett, B.Sc., Charles Carmichael Arthur Monro, and Thomas Francis Egan were proposed as Fellows.

The following were elected by ballot: as Fellows: Francis Miranda, Clarence Tierney, D.Sc., The Rev. Francis Rosslyn Courtenay Bruce, D.D., Henry Harwood Smith, Robert Barr, F.R.H.S., Henry Charles Abraham, and William Plane Pycraft; as a Foreign Member, Dr. John Isaac Briquet; as an Associate, William Barclay.

The following were elected by show of hands Auditors for the Society's Accounts for the financial year which ended on April 30:—For the Council: Mr. E. T. Browne and Dr. W. T. Calman; for the Fellows: Mr. S. Edwards and Mr. L. V. Lester-Garland.

The President announced that a Ballot would take place on June 21st next.

Dr. A. B. RENDLE, F.R.S., Sec. L.S., showed a seedling oak, three years old, with a tap-root over thirty inches in length, which he had dug up from his garden on heavy clay. The unusual length was ascribed to the drought of 1921.

After Mr. R. PAULSON had contributed some observations, Dr. C. E. MOSS remarked that at the Cape of Good Hope *Quercus pedunculata* produced roots as short as its congener, *Q. sessiliflora*, in place of the longer root-system noticeable in the former species in Britain.

Professor W. T. GORDON, F.G.S., introduced by Dr. D. H. SCOTT, F.R.S., F.L.S., exhibited an extensive series of lantern-slides illustrating recently obtained specimens of the fossil coniferous genus *Pitys*, obtained from beds of siliceous volcanic ash, at Gullane, 17 miles east of Edinburgh. These comprised a new species, showing cortex and leaves; hitherto nothing was known of the genus, except pith and wood. The most interesting point is the discovery of the leaves.

Dr. D. H. SCOTT pointed out that the leaves showed merely petiolar structure; was there a lamina present? He emphasized the great degree of anatomical development attained by these early plants.

Lieut.-Col. J. H. TULL WALSH said as regards the relation of silica to plants, certain moulds are stated to reduce the silica in laterite. In miners' tuberculosis we know that the presence of colloidal silica encourages the growth of *Bacillus tuberculosis*; and this effect is demonstrated by Prof. Cummins of the Bristol University in the "Tropical Diseases Bulletin" for last March. In the Mogadow creek, N.E. of the Chundion river, tree stumps are found in which silica has displaced the lime of petrification.

Mr. S. L. GHOSE (visitor) also spoke, and Prof. Gordon answered the questions raised.

The next paper, "The Crustacean Plankton of the English Lake District" by Mr. ROBERT GURNEY, F.L.S., was read in title.

Mr. S. L. GHOSE briefly explained the paper he contributed on "A Systematic and Ecological Account of a Collection of Blue-green Algæ from Lahore," pointing out that while much work had been done in India on phanerogamic botany, the lower cryptogams had been almost entirely neglected. The paper was communicated by Prof. F. E. FRITCH.

Mr. JAMES GROVES, F.L.S., presented a short paper entitled "Notes on Indian Charophyta."

Mr. J. G. H. FREW demonstrated the chief points of his paper, "On the Morphology of the Head-capsule and Mouth-parts of *Chlorops tenuipus* Meig. (Diptera)" (communicated by Dr. A. D. IMMS, F.L.S.); whilst the last paper—also communicated by Dr. Imms—was by Mr. A. M. ALTON, "On the Genital System of the Wood-boring Beetle, *Lyctus brunneus* Steph.," in continuation of a former paper, but now dwelling upon the extraordinary length both of the ovipositor and the rectum.

May 10th, 1923.

Dr. A. SMITH WOODWARD, F.R.S., President,
in the Chair.

The Minutes of the General Meeting of the 3rd May, 1923, were read and confirmed.

Mr. William Plane Pycraft was admitted a Fellow.

Certificates in favour of Miss Margery Knight, Miss Joan Beauchamp Procter, F.Z.S., Rev. William Charles Tippet, William Fawcett, B.Sc., Charles Carmichael Arthur Monro, and Thomas Francis Egan were read for the second time.

Prof. Nalini Mohan Mukerjee, M.Sc., Mr. Basant Lal Gupta, M.Sc., and Lilian Alice Mabel, Lady Richmond-Brown were proposed as Fellows.

The President announced that a vacancy in the list of Associates was created by the death of William Henry Pearson.

Letters were read from Dr. JOHN ISAAC BRIQUET and Mr. WILLIAM BARCLAY thanking the Society for their election as Foreign Member and Associate respectively.

Dr. PAUL KAMMERER, of Vienna, delivered a lecture on "Breeding Experiments on the Inheritance of Acquired Characters," of which the following is an abstract; it was illustrated by lantern-slides, specimens, and preparations under the microscope. [Note.—The same lecture was printed *in extenso* in 'Nature,' 12 May, 1923, pp. 637-40.]

In 1909 Dr. Kammerer ascertained that *Salamandra atra* and *S. maculosa* can be bred to interchange their accustomed reproductive characters. If young specimens of *S. maculosa* are kept on a black background they lose much of their yellow markings and appear mainly black; their offspring if similarly treated show a row of small spots in the middle line of the back; if however, these last are reared on a yellow background, these spots fuse to a longitudinal stripe.

The yellow markings of the parent generation reared in yellow surroundings increase at the expense of the black colour; and their descendants, kept in like manner, show yellow in wide bilateral stripes. In the Vienna woods whence he procured his Salamanders, only typically marked specimens occurred, though the striped form (forma *teniata*) is also found in the open. In later experiments

Salamanders from the Hartz Mountains were used, and they showed immediately after metamorphosis, their striped marking; those obtained from Heidelberg were irregularly spotted, but arranged their markings during growth into *lineata*. This development is also reversible; Mr. E. G. Boulenger has confirmed this, and has obtained results far more beautiful and significant than those now under review.

If spotted and naturally striped Salamanders are crossed, Mendelian characters are shown, the spots are dominant, the stripes recessive. If one crosses naturally spotted Salamanders with experimentally striped individuals, the hybrids are intermediate in character.

If ovaries of spotted females are transplanted into naturally striped ones, the appearance of the young is determined by the true mother, not the foster-mother, and are irregularly spotted. If on the other hand ovaries of spotted females are transplanted into artificially striped ones, then, if the father is spotted, the young are line-spotted; if the father is striped, the young are wholly striped.

Success has been obtained in developing the rudimentary eye of *Proteus* into a full-sized functioning eye, by means of red light for five years from birth. Exposure to ordinary daylight is not effective, the skin which covers the rudimentary eye is filled with dark pigment sufficient to arrest the development of the eye, but red light causes no pigmentation in the skin, and only under the influence of this chemically inactive light is regression overcome.

The development of the nuptial pad in the male *Alytes*, midwife toad, which passes its mating period in water, is not found on those individuals which mate on land, where no trace of a pad is discernible, yet it can be made to appear by compelling them to mate in water like other European batrachians. This is done by raising the temperature, when the mating animals stay longer in the water than usual, otherwise they would be dried up; later in life compulsion is unnecessary, they take to water of their own accord when desirous of mating.

In 1914 experiments were carried out on the Ascidian, *Ciona intestinalis*; if the siphons, the inhalent and exhalent tubes, are cut off, they grow larger than before; repeated amputations produce specimens in which the siphons present a jointed appearance. The offspring of these individuals have longer siphons, but the jointed appearance has been smoothed out; that is, the regeneration is not transferred to the progeny, but the locally increased intensity of growth is so.

During the war the experimental animals whose pedigree was known, and had been followed for fifteen years, were lost.

The President having opened the discussion, Prof. E. W. MacBride, F.R.S. (visitor) explained that, as Prof. Kammerer would reply to any criticisms in German, he would gladly act as his interpreter.

Dr. W. BATESON, F.R.S., having complimented the lecturer on his enthusiastic devotion to his subject, dissented from several of his conclusions.

Mr. J. T. CUNNINGHAM (visitor) said that he was not altogether in agreement with Dr. Kammerer, nor with the criticisms made by Dr. Bateson. He maintained that adaptive characters have nothing to do with specific characters, and that species are not distinguished by adaptations. He thought that Dr. Kammerer's evidence was not presented with sufficient precision, and the relation between the external stimuli and the results described has been left too vague, as in the case of *Alytes*. In *Proteus* and *Salamandra* that is not the case, but the evidence of heredity in the latter case is somewhat vague. In *Proteus* the increase of the eye under the action of light is evidence that the reduction of the eye in evolution was due to the absence of light.

Prof. E. S. GOODRICH, F.R.S., Sec.L.S., while admiring the interesting results of Dr. Kammerer, was not satisfied as to his interpretations. For instance, the reappearance of the large eye in *Proteus* on the application of red light seems to prove that the factors of inheritance necessary for their production remained unchanged during the long period in which *Proteus* has lived in the dark since its large-eyed ancestor first entered the caves.

The lecturer replied, Prof. MacBride acting as interpreter. He submitted that the criticisms of Dr. Bateson and Mr. Cunningham were irrelevant, and remarked that control experiments would be carried out in Cambridge. The number of individuals subjected to his experiments varied from as few as twenty to as many as a hundred in different cases.

May 24th, 1923.

Anniversary Meeting.

Dr. A. SMITH WOODWARD, F.R.S., President,
in the Chair.

The Minutes of the General Meeting of the 10th May, 1923, were read and confirmed.

Mr. William Henry Wilkins, Dr. Clarence Tierney, and the Rev. Rosslyn Bruce, D.D., were admitted Fellows.

Mrs. Nora Lilian Alcock was proposed as a Fellow.

The Treasurer made his Annual Report on the Accounts of the Society, and the Statement (see pp. 24-26), duly audited, was received and adopted.

The General Secretary reported that since the last Anniversary the following had died or their deaths been ascertained, namely :—

14 Fellows.

Sir Isaac Bayley Balfour.	John Henry Gurney.
Arthur Wells Bawtree.	Lawrence Lewton-Brain.
John Lewis James Bonhote.	Dr. James Charles McWalter.
Dr. William Carruthers.	Most Rev. Samuel Tarratt de
Sir Ernest Clarke.	Terrot Nevill, D.D., Bishop
William Edward de Winton.	of Dunedin & Primate of
Henry John Elwes.	New Zealand.
Thomas Bennett Goodall.	Frederic Newton Williams.
Dr. Ralph Gooding.	

3 Associates.

William Cole. William Henry Pearson. William Barclay.

1 Foreign Member.

Prof. Gaston Eugène Marie Bonnier.

That the following 16 Fellows had withdrawn :—

Charles Alfred Barber.	Harold Warren Monington.
Dr. Paul Andries van der Bijl.	Phra Vanpruk Picharn.
Rev. Alfred John Campbell.	Mrs. Mary Ross Hall Pole-
Mrs. Maud Hands (<i>née</i> Samuel).	Evans (<i>née</i> Thomson).
Dr. Marcus Manuel Hartog.	Jesse Reeves.
Stuart Hogg.	Charles Francis Massey Swyn-
Sir Frederick John Jackson,	nernton.
K.C.M.G., C.B.	Harold Stuart Thompson.
Edmund Gustavus Bloomfield	Prof. Robert Wallace.
Meade-Waldo.	Dr. Richard Norris Wolfenden.

During the same period 31 Fellows have been elected, of whom 26 have qualified up to the present. Also 1 Foreign Member and 2 Associates have been elected.

The Librarian's report was read, showing that donations from private individuals and editors amounted to 229 volumes and 483 pamphlets and parts, by exchange 197 volumes and 683 detached parts, by purchase 183 volumes and 235 parts; in all, the accessions amounted to 609 volumes and 1401 pamphlets and separate parts. Books bound amounted to 685: 75 in buckram, 245 in half-buckram, 198 in cloth, and 167 rebacked.

The General Secretary having read the Bye-laws governing the Elections, the President opened the business of the day, and the Fellows present proceeded to vote for the Council.

The Ballot for the Council having been closed, the President appointed Mr. H. N. Ridley, Mr. W. S. Rowntree, and Mr. R. Paulson, Scrutineers, who, having examined the ballot papers and cast up the votes, reported to the President, who declared the result as follows:—

*Dr. W. BATESON, F.R.S.; Dr. GEORGE P. BIDDER, M.A.; *R. H. BURNE, Esq.; Dr. WM. THOS. CALMAN, F.R.S.; Prof. FELIX E. FRITCH, D.Sc.; Prof. E. S. GOODRICH, F.R.S.; Prof. Dame HELEN GWYNNE-VAUGHAN, D.B.E.; Sir SIDNEY F. HARMER, K.B.E., F.R.S.; Dr. ARTHUR WM. HILL, F.R.S.; Dr. B. DAYDON JACKSON; *L. V. LESTER-GARLAND, M.A.; HORACE W. MONCKTON, F.G.S.; JOHN RAMSBOTTOM, M.A.; Dr. A. B. RENDLE, F.R.S.; The Rt. Hon. LIONEL WALTER, Baron ROTHSCHILD, F.R.S.; Dr. E. J. SALISBURY; THOMAS ARCHIBALD SPRAGUE, B.Sc.; *R. J. TABOR, B.Sc.; *Prof. F. E. WEISS, F.R.S.; and Dr. A. SMITH WOODWARD, F.R.S.

(New Councillors are shown by an asterisk. The retiring Councillors were: Prof. MARGARET BENSON, D.Sc.; E. T. BROWNE, M.A.; G. W. E. LODER, M.A.; FRANK A. POTTS, M.A.; and C. E. SALMON, Esq.)

The Ballot for the Officers having been closed, the President appointed the same Scrutineers, who, having examined the ballot papers and cast up the votes, reported to the President, who declared the result as follows:—

President. Dr. ALFRED BARTON RENDLE, F.R.S.

Treasurer. HORACE W. MONCKTON, F.G.S.

Secretaries. Dr. B. DAYDON JACKSON.

Dr. W. T. CALMAN, F.R.S.

JOHN RAMSBOTTOM, M.A.

The President then delivered an Address, which was illustrated with lantern-slides (see p. 27).

TREASURER'S ACCOUNTS FOR THE YEAR ENDED APRIL 30TH, 1923.

(Presented at the Anniversary Meeting, May 24th, 1923.)

*Receipts and Payments of the Linnean Society from May 1st, 1922, to April 30th, 1923.**General Account.*

<i>Receipts.</i>		£	s.	d.	<i>Payments.</i>		£	s.	d.
To Balance at Bankers on 1st May, 1922	.....	625	6	8	By Taxes and Insurance	.....	27	12	5
" Cash in hand	.....	4	7	10	" Repairs and Furniture	.....	209	3	8
" Interest on Investments	.....	355	17	11	" Coal, Electric Current, and Gas	.....	119	2	0
" Admission Fees	.....	198	0	0	" Salaries	.....	947	15	0
" Annual Contributions	£2228 4 0				" Library:—				
do. Goodenough Fund..	4 0 0				Books (New Books £34 18 8)	£259 5 0			
					Binding	172 13 2			
							431	18	2
" Sales of Publications:—					" Expenses of Publications:—				
Transactions	£124 13 8				Printing	£875 13 4			
Journals	255 4 7				Illustrations	212 9 7			
Proceedings and Catalogues	5 16 3				Distribution	54 8 4			
							1142	11	3
							249	19	1
" Fellows' postal account, deposits	.....	385	14	6	Miscellaneous Printing and Stationery	.....			
" Donations in aid of Publications	.....	16	12	2	" Petty Expenses (including Tea and Postage)	£130 3 10			
" Miscellaneous Receipts	.....	71	0	0	" Fellows' postal account	11 16 8			
" Fractional Surplus on conversion of Midland Railway Stock	.....	35	0	5			142	0	6
							15	0	0
							24	11	7
					" Linnen Medal	.....			
					" Transfer to Separate Account	.....			
					" Balance at Bankers, 30th April, 1923	£513 9 3*			
					Do. deposits, Fellows'				
					postal account	94 4 2			
					" Cash in hand	7 4 4			
							614	17	9
							£3924	11	5

* £322 already allocated for printing in hand.

Investments on April 30th, 1923.

General Account.

£ s. d.	Value, 30th April, 1923. £ s. d.
450 0 0	Forth Bridge Railway 4 per cent. Stock
1000 0 0	Metropolitan Consolidated 3 per cent. Stock
1200 0 0	India 3 per cent. Stock
1000 0 0	Eastern Bengal Railway 4 per cent. Debenture Stock
1000 0 0	Great Western Railway 4 per cent. Debenture Stock
312 0 0	London Midland & Scottish Railway 4 per cent. Preference Stock (resulting from conversion of £500 Midland Railway 2½ per cent. Consolidated Perpetual Preference Stock)
3200 0 0	5 per cent. War Loan, 1929-47
	£7070 7 6

Separate Account.

£ s. d.	£ s. d.
£900 9 5 { 232 5 0 638 4 5	Metropolitan Water Board 3 per cent. "B" Stock (Westwood Fund) @ 68
	Ditto @ 68
	Ditto @ 68
	New South Wales 3½ per cent. Stock, 1930-50 (Trail Award Fund) @ 80
	2½ per cent. Consolidated Stock (Crisp Award Fund) @ 59¾
	East India Railway 3½ per cent. Debenture Stock (Tagart Fund) @ 68
	{ 50 0 0 (Westwood Fund) 50 0 0 (Library Catalogue Fund) 100 0 0 (Hooker Lecture Fund) } (Goodenough Fund)
£250 0 0 { 50 0 0 50 0 0 100 0 0	4 per cent. Victory Bonds..... @ 94¾
	£1440 14 0

HORACE W. MONCKTON, *Treasurer.*

We have (in conjunction with the Professional Auditor, who certifies as to all details) audited the Accounts of the Society for the year ended 30th April, 1923, and found them correct. We have verified the Investments and Bank Balances.

Dated this 15th May, 1923.

W. B. KEEN, *Chartered Accountant.*

Auditors.
A. SMITH WOODWARD,
A. B. RENDLE,
EDWARD T. BROWNE,
W. T. CALMAN,
STANLEY EDWARDS,
L. V. LESTER GARLAND.

PRESIDENTIAL ADDRESS, 1923.

A HUNDRED years ago yesterday a few Fellows of the Linnean Society met to discuss and adopt a series of rules for a Zoological Club which it had been decided to form within the Society. It was apparently thought that some of the more technical communications on comparative anatomy and on British zoology could be received and discussed more satisfactorily by a small body of specialists than by a general meeting of the Society. The question of zoological nomenclature even then was also agitating the Fellows, and this subject was relegated to the select small circle so early as 1825. The Club, however, with its separate meetings, never received much support. The minute book records that on several occasions there was no quorum to form a meeting; and in 1827 when the Honorary Secretary, Mr. N. A. Vigors, left to become Secretary of the newly formed "Zoological Institution" (as it was then termed), the Club gradually declined until in November 1829 it came suddenly to an end without any formal closing. From that time onwards those who wished to pursue zoology separately and intently joined the "Scientific Committee" of the then chartered Zoological Society, and the Linnean was left to pursue its old course. During the past century our Society has been actively engaged in biology in its widest sense; and while publishing purely technical papers on both botany and zoology, it has always fostered discussions in which the devotees of both these branches of biological science could effectively take part. With a larger Fellowship than at any previous time, and with more numerous attended meetings, the Society still takes the broad view which it inherits from the illustrious Linnæus, and the modern problems of heredity and mendelism—indeed all the factors and phenomena of organic evolution—can best be treated here. During the past session, to name only two examples, we have published Prof. Garstang's examination of the theory of recapitulation (or Haeckel's biogenetic law), and we have received and discussed Dr. Kammerer's masterly account of his experiments which he considers to prove the inheritance of acquired characters.

These comprehensive discussions particularly interest a palæontologist because he tries to recover the actual documentary evidence of the history of the world of life and is thus concerned in tracing lineages. He still adopts the Linnean plan of nomenclature as a matter of convenience. His use of specific, generic, and family names approximates indeed more closely to the broad conception of Linnæus than to the narrower sense in which they are now usually applied to the classification of existing plants and animals. Sometimes, however, he feels that this nomenclature scarcely expresses his meaning. Many of his so-called genera include species derived from more than one lineage; many of his

so-called families are also polyphyletic; and it would be more convenient if he could devise a nomenclature which would not only indicate the lineage but also the stage of evolution therein. He deals in fact with slowly changing grades which are approximately the same in each parallel lineage of a group as it is traced through successive periods of time. His ideal definition of any category includes not merely the usual diagnostic characters, but also a statement of tendencies in evolution. He has already applied this method of classification to certain ammonites and brachiopods with much success; and, where each individual retains the whole of its skeleton from early youth to old age, the method is often easily applicable.

As concrete instances of these lineages, which have now been well studied, may be mentioned those of the ammonites, graptolites, Cretaceous polyzoans, and Palæozoic corals. Equally important are the parallel lineages which have been recognised among several groups of Tertiary mammals. On the whole, perhaps, the case of the graptolites is the simplest illustration to begin with and may be most concisely stated*.

In the earliest known graptolites the polyps are arranged on an irregularly branching skeleton, often forming a hard network. The thecæ, or cells which lodged the polyps, are varied in shape and evidently show that these primitive skeletons belong to several genera or species. Somewhat later, graptolites with many symmetrically arranged branches make their appearance; and it is to be noted that the symmetry of the arrangement would be advantageous in tending to ensure an equal supply of food to each branch. Next, there appear successively eight-branched, four-branched, and two-branched forms. Eventually, just before the race becomes extinct, nearly all the graptolites are simple rods. In each of these grades the variety in the shapes of the thecæ is at least as great as in the primitive ancestors. Presumably therefore each of the original types has independently followed the same trend of evolution, successively producing colonies of the same simplified shape. The Tetragraptids, Diplograptids, and Monograptids, therefore, are not respectively true genera as was originally supposed when they were named; they are merely corresponding stages in the evolution of several parallel groups, which were all striving towards a more effective and uniform distribution of food to the colony.

The case of the Palæozoic corals has lately been illustrated by an instructive diagram by Dr. W. D. Lang†. In each lineage, as distinguished by the characters of its septa, tabulæ, etc., the initial simple coral first begins to form a loose cluster. Somewhat

* H. A. Nicholson & J. E. Marr, "Notes on the Phylogeny of the Graptolites," *Geol. Mag.* [4] vol. ii. (1895), pp. 529-539. Also Gertrude L. Elles, "The Graptolite Faunas of the British Isles," *Proc. Geol. Assoc.* vol. xxxiii. (1922), pp. 168-200.

† W. D. Lang, "Trends in British Carboniferous Corals," *Proc. Geol. Assoc.* vol. xxxiv. (1923), p. 122.

later the cluster becomes compacted, so that the corallites are elongated and in close contact. Next the colony is compressed, so that they become hexagonal in section. Finally, the walls between the individual corallites disappear, and the septa of one are continuous with some of those of its six neighbours. Whenever the complete lineage can be traced this is proved to be the inevitable succession of skeletal forms.

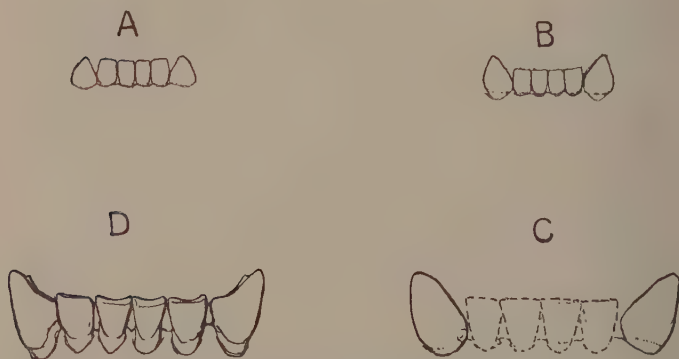
The first lineages to be studied in detail were those of the ammonites, described by the late Alpheus Hyatt. He recognised that as each lineage progressed, and as the successive shells acquired new characters, they invariably passed through the stages represented by their predecessors before they reached this higher plane. The earlier stages might be abbreviated—some might even be omitted—still there was evidence of them, and they were merely slurred over so that the later adult characters might be hurried on. Subsequent studies of lineages of ammonites by other authors have entirely confirmed Hyatt's conclusions, and the same results have been obtained more recently by the examination of many other groups of fossils.

The tracing of lineages among vertebrates, especially mammals, has afforded repeated examples of the recapitulation of ancestral characters in the immature stages of organisms. Sometimes they can only be detected by close observation, but they are nevertheless evident when pointed out. Even among the scanty fossils representing the lineage of man, there seems to me to be one discovery definitely proving a case of recapitulation in the modern human skeleton, and as this has not hitherto been sufficiently appreciated, I wish to emphasise it by a new diagram (fig. 1). Many years ago the late Joseph Leidy pointed out that among the extinct ancestral horses the milk or temporary dentition of a genus always more closely resembled the permanent dentition of its predecessor in the lineage than did the permanent dentition of the same genus. In other words, the temporary dentition of the later and more advanced genus repeated some of the features of the final dentition of the immediately preceding genus. The later type retained the old pattern in its temporary dentition, but progressed forwards in having a more effective grinding dentition for its adult career. If the primitive human skull found at Piltdown, Sussex, be regarded as belonging to the immediate predecessor of modern man, exactly the same phenomenon is observable in him. The temporary lower canine tooth of modern man very closely resembles in shape the permanent lower canine tooth of the fossil Piltdown man; and to retain its apex at the level of the crown of the adjacent teeth in the immature modern jaw it is never completely extruded (fig. 1 A). If the base of its crown were raised to the same level as that of the adjacent teeth (fig. 1 B), it would be prominent and interlock with the upper canine to the same degree as in Piltdown man (fig. 1 C) and equally approach the ape-pattern (fig. 1 D). Modern man is thus

proved to have advanced beyond his immediate predecessor in at least one important character, but in his immature state he retains that character in a slightly modified form.

The palæontologist, therefore, is convinced that whenever he is able to trace lineages he finds evidence of the recapitulation of ancestral characters in each life history; and he fails to appreciate the subtleties of logic of those who argue the question from the comparatively narrow standpoint of the study of existing life. He is equally convinced that the phenomena he observes when tracing lineages can only be explained by assuming that acquired characters are inherited. He finds a gradual advance towards complete harmony with the environment in successive forms—adaptations to sufficiency of feeding, to effectiveness in locomotion,

Fig. 1.



Diagrammatic front views of the lower incisors and canine teeth, showing that if the milk dentition of modern Man (A) were modified by the complete extrusion of the canines (B), this would resemble the permanent dentition of Piltown fossil Man (C) more closely than does the permanent dentition of any Ape, such as the Chimpanzee (D); three-quarters nat. size.

and so forth; and it is difficult to believe that these steps forward are not influenced by the struggle of successive generations with the conditions under which they live. Kammerer's experiments on living animals are said to prove that newly acquired characters are not always inherited in the same manner as more deeply ingrained characters—that, in fact, they differ in not fulfilling the Mendelian expectation. A palæontologist, studying lineages, will welcome this result if it can be substantiated, for he often notes rhythm in evolution—unequal rates of progress—which may imply that under certain circumstances some characters may need repeated acquisition in a longer series of generations than others before they become part of the permanent inheritance.

The greatest difficulties are met with in discovering the beginnings of any lineage and the fundamental points of divergence. I have already alluded to some of these difficulties in previous addresses when referring to certain fossil fishes, and I wish now to mention three other striking instances which have lately been studied.

The Ichthyosauria, or fish-shaped reptiles, which seem to have lived in all seas throughout the Mesozoic era or "age of reptiles," appear suddenly in the Trias of both Europe and North America and Spitzbergen with their adaptations to strictly aquatic life almost complete. These early forms only differ from later Ichthyosauria in retaining more traces of their land ancestry, such as the less deep overlapping of the bones in the skull, the less uniform shape of the teeth, and the greater elongation of the humerus, radius, and ulna in the fore limb. It must also be noted that they are all of comparatively small size. Some have the fore limb or paddle rather elongated (longipinnate), others have it rather broad (latipinnate), and in his recent monograph of the Ichthyosauria * Baron von Huene points out that each of these types begins a lineage which can be traced throughout the life history of the group until its end at the close of the Cretaceous period. The progressive changes in these two lineages are comparatively small. The bones of the skull soon become very deeply overlapping, as in fishes and cetaceans, the teeth attain uniformity and are implanted in a groove, and the vertical tail fin acquires maximum effectiveness. It can only be observed that towards the end of the Jurassic period the jaws sometimes become toothless in the adult, the fore limbs are changed into more flexible paddles by the persistence of much cartilage round the bones in the digits, and the lower lobe of the tail becomes more flexible by the attenuation of the end of the vertebral axis which supports it. Ichthyosaurs are, indeed, in all essentials the same from the beginning to the end, and although Baron von Huene supposes that the small Mesosaurians of the Permian period may perhaps represent their semi-aquatic ancestors, there is only slight basis of fact for this hypothesis. With our present knowledge their origin remains a mystery.

The Pterosauria, or flying reptiles, have the same range in time as the Ichthyosauria, and also exhibit remarkable uniformity. Only a single skeleton has hitherto been found in the Trias, the so-called *Tribelesodon* from northern Italy, so that the earliest member of the group is imperfectly known. The specimen has been studied lately by Baron F. Nopcsa †, who finds that in every character which can be observed it is a well-formed Pterosaurian. Its fore limbs are already efficient wings, and the hind limbs only

* F. von Huene, "Die Ichthyosaurier des Lias und ihre Zusammenhänge." Berlin, 1922.

† F. Nopcsa, "Neubeschreibung des Trias-Pterosauriers *Tribelesodon*," *Palæont. Zeitschr.* vol. v. (1922), pp. 161-181, pl. ii.

appear to differ from those of the later flying reptiles in being relatively large. As the group is traced upwards in time some of its members are progressively larger, until just before its extinction at the end of the Cretaceous period it is represented by *Pteranodon*, with a wing-span of 20 feet or more, the largest flying animal which ever existed. In the course of this evolution some of the Pterosauria become toothless, like *Pteranodon* itself, but the only essential change is a firmer fixation of the wings and a reduction of the clawed digits to mere splints on the wing finger. From its very beginning, so far as our present knowledge extends, the Pterosaurian was an efficient glider or flier, and no real clue to its ancestry has hitherto been found.

Finally, consider the origin of the Mammalia. Palæontologists pride themselves on having found during recent years almost every gradation between certain skeletons of the Permian and Triassic Theromorph reptiles of South Africa and the skeleton of the monotreme mammals. The series is, indeed, now remarkably complete and convincing. There can be no doubt, from the discovery of a few isolated jaws and limb bones both in Europe and North America, that representatives both of these lowly mammals and even of marsupials were widely spread during the latter half of the Mesozoic era. They are still better known by comparatively specialised forms in deposits dating back to the very beginning of the Tertiary era both in Europe and in North America. Nearly all of them then suddenly disappear in both countries, and they are replaced by typical placental mammals, already differentiated into several modern groups, which seem to have no connection with the primitive mammals which immediately preceded them in the same regions. At this stage, therefore, there is a complete gap in the series; and even if the earliest mammals can be clearly traced back to antecedent reptiles in South Africa, the higher mammals characteristic of the present world still appear without any recognisable ancestors.

A possible explanation is that each new lineage began as a rapid development in one community in a locality of restricted extent. In this case its initial stages would be represented by comparatively few fossils in a small area, or none of them may have been preserved owing to local unfavourable circumstances.

It is already known that there were such rapid local developments. The earliest stages of the elephants, for example, are found only in Egypt, and they are represented by so variable a series of forms that it is difficult to classify them. They are also accompanied by strange mammals more or less related to ancestral elephants. The region of which modern Egypt is now a part seems, therefore, to have been the place of origin of the elephant-lineage. Another strange and rapid development occurs in the Middle Eocene rocks of Wyoming, where the small-brained *Dinocerata* suddenly arose in many forms, but as suddenly died out without ever spreading. The local development and sudden end

of the gigantic rhinoceros like *Baluchitherium* and its allies in central Asia are also noteworthy in the same connection.

If, however, there seems to be some hope of discovering the beginning of the various lineages when exploration has proceeded further, the difficulty of explaining their end appears to be as great as ever. As soon as they have attained their widest geographical range, have become perfectly well adapted to their environment, and are represented by the largest individuals, they begin to show signs of decline and disappear at least as rapidly as they originated. Indeed, in a modified sense, Cuvier's early theory of the successive "revolutions of the globe," which have culminated in the world of life as it now exists, is still distinctly plausible. The ancestors of the crustaceans and arachnids, for example, when they held the foremost place at the beginning of the Devonian period, attained their largest size—some with a body six feet in length—just before the dominance of fishes, which at first were comparative dwarfs. Many of the reptiles, too, immediately before they lost their dominant position at the end of the Cretaceous period, were among the largest animals that ever lived; and when these disappeared, there was for a long period among the mammals which replaced them no animal larger than a sheep. The alternating luxuriance and poverty in the development of life in successive phases is indeed striking, and at present baffles explanation.

Most remarkable, perhaps, is the fact that we rarely find any evidence of direct competition between the flourishing type that is doomed and the incipient higher type that is destined to replace it. For example, so far as we know, the Ichthyosaurians, Mosasaurians, and other giant sea-reptiles, which ranged in abundance through all seas from the Arctic regions to New Zealand, never came in contact with the whales and porpoises which were eventually to take their place. Fossils already discovered in Egypt suggest that the toothed whales originated from primitive land-carnivores after the old sea-reptiles had disappeared. When, however, this new race passed into the vacant seas, it soon multiplied and spread widely; and by the end of the Eocene period there were toothed whales (*Zeuglodon*) some 70 feet in length.

The solution of the problems suggested by these various facts is delayed and rendered all the more difficult by the astonishing uniformity in the geographical distribution of life in past ages. When the corresponding fossil-bearing rocks in different parts of the world are explored, there is as a general rule very little difference in their contained faunas and floras. When Ameghino, for instance, first found reptiles and fishes in a Jurassic stratum in Patagonia, he sent me a skull of a sea-crocodile (*Metriorhynchus*) and a skull of a predaceous ganoid fish (*Hyposcormus*), such as might have been found similarly associated in the Middle Jurassic Oxford Clay at Peterborough in England. When I received the

first Triassic fishes from New South Wales, Australia, and from Spitzbergen, I found the peculiar ganoid *Belonorhynchus* conspicuous in both these localities. When the 'Discovery' expedition met with fish-remains in the Devonian rocks of Antarctica, they collected very little which might not have been found in the corresponding formations in Scotland. During recent years the discoveries of fossil vertebrates in the west of North America, which yielded so many novelties at the end of the last century, have become comparatively monotonous. They are merely perfecting our knowledge of known types and revealing endless variants of the same. Even the preliminary reports on the fossil vertebrates lately discovered by the Russians and Americans in Central Asia do not promise the rich harvest of novelties which it was hoped to obtain from that interesting region. It is necessary, indeed, still to depend for real progress on finding the records of local accidents—oases in the dreary desert of uniformity. Dr. C. D. Walcott added a whole chapter to our knowledge of the earliest marine fauna by his discovery of a deposit of greasy shale which could preserve soft-bodied animals among the Cambrian formations in the Rocky Mountains of Canada. The prospectors for oil, now visiting and studying the remotest corners of the globe, are also giving valuable help in discovering exceptional formations and localities which paleontologists may profitably explore further. We have to depend on accidental help of this kind from many sources when we are looking for fossils of the most fundamental import.

In ending now my term of office, it only remains for me to thank the Fellows of the Linnean Society for the great honour they did me four years ago when they first elected me to be their President. I also wish especially to express my appreciation of the kind help and forbearance of my fellow Officers, the Council, and Permanent Staff for the period during which I have served. It was just over forty years ago that I began to attend the meetings of the Society, and since I became a Fellow it has been one of my greatest pleasures to be closely associated with its work. After holding the highest office for the full term, I have the final gratification of handing it over to an old friend and valued colleague, the distinguished botanist whom you have chosen to be your President to-day. I not only wish him all success, but hope that he too will carry away happy memories such as those which I shall retain for the rest of my life.

Canon G. R. BULLOCK-WEBSTER then moved: "That the President be thanked for his excellent address, and that he be requested to allow it to be printed and circulated amongst the Fellows," which, after being seconded by Mr. A. H. MAUDE, he put to the meeting and reported carried.

The President having acknowledged the Vote of Thanks, proceeded to address Sir JAMES ALLEN,—

The Council of the Linnean Society has this year awarded the Linnean Gold Medal to Mr. THOMAS FREDERIC CHEESEMAM, to express its high appreciation of the valuable services rendered by him to botanical science through his life-long study of the vegetation of the most distant portion of our overseas dominions.

When Mr. Thomas Kirk died in 1897, botanists learned with regret that he had made very little progress with the "Students' Flora of New Zealand," on which he had been engaged. They felt, however, that it was a matter for congratulation when they received the news that the Government of New Zealand, realising the importance of preparing a complete Flora of the Dominion, had commissioned Mr. Cheeseman to continue and complete the work, and relieved him of his official duties as Curator of the Auckland Museum to enable him to do so. Mr. Cheeseman's arduous preparation for his task is modestly summed up by himself in the Introduction to his "Manual of the New Zealand Flora," where he states that he began his original researches in 1870, and personally examined almost the whole country from the Kermadec Islands and the North Cape to Otago. Mr. Cheeseman's completed work, published in 1906, is regarded by all who have used it as one of the best manuals of its kind. His two large volumes of "Illustrations," published in England in 1914, with the editorial help of another of our Fellows, Dr. W. B. Hemsley, are also of great assistance to the student of the New Zealand Flora.

Mr. Cheeseman has further devoted attention to the Flora of the Subantarctic Islands of New Zealand, and he contributed a systematic account of the Flowering Plants and Ferns to the publication on these Islands edited by Dr. Chilton. To his recent description of the Vascular Flora of Macquarie Island, which forms one of the Reports of the Australian Antarctic Expedition (1911-14), he has added an interesting and suggestive discussion of the origin and affinities of the Antarctic Flora.

Mr. Cheeseman's services to science, however, are not limited to botany. As Curator of the Auckland Museum for many years, he has not only covered a wide field in Natural History, but has also made important contributions to Ethnology. He has brought together a unique collection illustrating the past history and customs of the disappearing Maori civilization, and has become a leading authority on the subject.

In asking you to convey to Mr. Cheeseman this token of our admiration and esteem, I think it is interesting to note that on the 19th of next month, before the medal can reach him, he will have completed his fiftieth year of Fellowship of our Society.

The High Commissioner suitably acknowledged the award, which he felt would be greatly appreciated throughout the Dominion of New Zealand, and undertook to transmit the medal to Mr. Cheeseman.

The General Secretary having placed on the table the obituaries of deceased Fellows, the proceedings terminated.

OBITUARY NOTICES.

After several months of illness consequent upon an overstrained heart, the result of unremitting labour in his Edinburgh position, Sir ISAAC BAYLEY BALFOUR, K.B.E., passed away at Courts Hill, Haslemere, on the 30th November, 1922. The son of John Hutton Balfour, Professor of Botany at Edinburgh from 1845 to 1879 (known to generations of students as 'Woody Fibre'), he was born in that city on the 31st of March, 1853, was educated at Edinburgh Academy, in turn passing through the Universities of Edinburgh, Strassburg, and Würzburg—his inherited tendency to botany being thus thoroughly called forth and trained; and besides taking D.Sc. at Edinburgh, he matriculated also in the faculty of medicine.

In 1874, whilst still an undergraduate, he was attached to the party which in 1874 proceeded to Rodriguez to observe a transit of Venus, and brought home his first foreign botanical collections. Resuming his medical studies, he graduated M.B. in 1877, proceeding to M.D. in due course in 1883; for botanic purposes he studied abroad as already mentioned.

He was appointed Professor of Botany at Glasgow in 1879, at the early age of 26; the next year he went to Socotra, there making ample collections, which took several years to work out. When practically complete, he offered his results for publication in our Transactions, but stipulated that they should not be published in successive parts, but in a volume. This could not be done as demanded, but the author succeeded in inducing the Royal Society of Edinburgh to publish the well-known substantial volume in 1888, of 446 pages and 100 quarto plates, forming vol. xxxi. of the Transactions of the Edinburgh Society.

Before this volume appeared, he was appointed Sherardian Professor of Botany at Oxford, and soon made his presence felt. The old connection of the Baxters was ended, the younger Baxter leaving. The arrangement of the beds was altered, and other changes were rapidly made, as for instance, in the herbarium, where the volumes of the Du Bois collection were cut up, and the sheets distributed amongst their congeners in the general herbarium. Happily the Morisonian and Dillenian collections were spared the like fate, but his presence was a stimulus after the tranquil reign of Prof. M. A. Lawson.

After four years in Oxford he migrated to Edinburgh, in succession to Alexander Dickson, becoming also Queen's Botanist for Scotland, and Regius Keeper of the Royal Botanic Garden in Inverleith Row, which he retained for 34 years.

During his active professorial life he added to his previous writings, but chiefly throwing his energies into the improvement of the gardens at Inverleith Row, and in working up such genera as *Primula* and *Rhododendron*, in which he became *facile princeps*. His earliest publication in our issues was an extract from a letter on the Rodriguez flora (Journ. Bot. xv. (1875)), followed by a new genus of Turneraceæ, *Mathurina*, in the same volume (1876). After describing some new plants from the same locality in the subsequent volume, he issued an excellent monograph of the genus *Halophila* in the Transactions of the Edinburgh Botanical Society, and then in our 17th volume of the Journal (Bot.) brought out a complete monograph of the Screw-pines, *Pandanus*. Smaller papers followed from time to time, during the period when he was in Socotra and working up its flora; latterly his chief contributions have been in the 'Notes' of the Edinburgh Botanic Garden.

Elected Fellow of our Society, 16th December, 1875, he served on our Council during 1884-85; Fellow of the Royal Society in 1884, and on its Council 1892-94. He formed part of the Departmental Committee of H.M. Treasury, which sat from 1900 to 1901, reporting H.C. 1901, no. 205. He did important work in editing certain German works, translated by the Rev. H. E. F. Garnsey, such as De Bary's 'Fungi, Mycetozoa and Bacteria' (1887); Sachs's 'History of Botany' (1890), and Goebel's 'Outlines of Classification and Special Morphology of Plants' (1887); and his labours in the establishment and early share in the editorship of the 'Annals of Botany' were notable.

Last year, finding the climate of Edinburgh trying to his health, he quitted Inverleith House, in the Botanic Garden, and came south to the milder climate of the Surrey hills, establishing himself on Courts Hill, above the town of Haslemere, and hoping to enjoy the scientific society of London. But that project was not to be realized; hardly had he arrived, when he was confined to his bed by medical orders, and although he rallied so much as to be taken out in a bath-chair, there remained no hope of a real cure, and he passed hence on the last day of November, 1922. [B. D. J.]

GASTON EUGÈNE MARIE BONNIER, Professor at the Sorbonne, Paris, was born in the year 1855, in Paris, where he passed his early years and received his education. For 14 years he remained in the École Normale, rue d'Ulm, as pupil preparer, assistant lecturer, and finally lecturer. In the laboratory attached to this school, Bonnier carried out his first experiments. In 1887, at the age of 32, he was summoned to succeed Duchartre in the chair of botany in the Faculty of Science, and there he displayed the same

powers of organization as in the school. When he entered upon his duties, his only materials were dried or preserved plants; but ultimately he succeeded in getting possession of some ground for the cultivation of plants and the building of a laboratory on the borders of Fontainebleau.

The year 1889 witnessed the foundation of the 'Revue générale de Botanique,' which is now in its 34th volume; from 1879 he issued a multitude of articles, together with some in collaboration with L. Mangin or C. Flahault. Perhaps the most striking item in his strenuous labours is his 'Flore complète illustrée en couleurs de France, Suisse, et Belgique,' of which six quarto volumes have been issued, from Ranunculaceæ to Compositæ.

He was elected on the 6th May, 1920, a Foreign Member, but his connection with our Society was short; he died in Paris on the 20th December, 1922, and was buried on the 2nd of January last. [B. D. J.]

DR. WILLIAM CARRUTHERS, F.R.S., Past-President of the Linnean Society during 1886-90, and a Fellow since 7th February, 1861, passed away a few days after the completion of his 92nd year.

Born at Moffat on the 29th May, 1830, he was intended by his father, Samuel Carruthers, a retail tradesman, for the Presbyterian ministry, and received his education at Moffat Academy, and Edinburgh University, which he entered in 1845 and was still a student in 1854, when he passed into New College, Edinburgh, for training to the pastoral office. By that time he must have shown special aptitude for natural science, as Professor John Fleming, who taught natural science in that institution, advised him to specialise in science. One of the early recollections of our late Fellow was, that this professor had a Great Auk, *Alca impennis*, in captivity, probably one of the last specimens so kept. Other teachers were John Hutton Balfour, George J. Allman, and John Goodsir, and his prospects of succeeding Fleming in 1858 were good, when John Anderson was appointed to the vacant chair. Forty-five years afterwards Mr. Carruthers discharged those functions at New College during 1903-04.

A short period as botanical lecturer at the New Veterinary College, Edinburgh, and Assistant Secretary to the Royal Society of Edinburgh, was followed by his appointment to the Botanical Department, British Museum, as assistant to J. J. Bennett, recently confirmed as Keeper, after the enquiry in 1860 into the department consequent upon the death of Robert Brown. He remained in this employment until his retirement in 1895, although in 1879 he was an applicant for the Chair of Botany in Edinburgh, when Alexander Dickson was appointed.

An energetic personality was naturally bound to be vigorous, and Mr. Carruthers took his full share in an active and stirring period. He was a pioneer in fossil botany, published discoveries of Graptolites as early as 1858, and the Geology of Moffat in 1859, both

by the Physical Society of Edinburgh, to which he belonged all his life. He published an important paper on *Lepidodendron* and *Calamites* in the Transactions of the Botanical Society of Edinburgh, and the present writer well remembers the presentation of a still more important paper in the old quarters of the Linnean Society at Burlington House, on the 18th of June, 1868, "On fossil Cycadean Stems from the Secondary Rocks of Britain," with its establishment of the genus *Bennettites* in the memoir in our Transactions, with 10 plates, in 1870.

As administrator in the British Museum his work was important, and absorbed his energies previously devoted to research. In 1871 he was appointed Keeper, at a period when the Royal Commission, presided over by the seventh Duke of Devonshire, was enquiring into the position of scientific instruction in Britain, and botany at the British Museum came under severe criticism from two sides: Kew claiming a monopoly of collections, and from the teaching colleges of London. In the end, the Botanical Department of the British Museum remained, and the new keeper proceeded to develop its powers. In the years 1881-3, the collections from the botanical, zoological, and geological departments were removed from the overcrowded galleries at Bloomsbury, to the new building facing Cromwell Road, South Kensington, and thereby the exhibits were more adequately displayed. A special library had to be formed, as the Banksian Library was tenaciously held by the Printed Book Department at Bloomsbury, only certain duplicates being allowed to go westward. Our late Fellow threw himself whole-heartedly into the acquisition of new libraries, namely, a general library common to all the departments from which they could draw, or refer to, consisting of series of volumes of societies' issues which embraced more sciences than one; the other libraries being those required in constant use by the respective departments, and specially relating to their own branch. Mr. Carruthers employed outside assistance to copy the pre-remarks of the Banksian and later volumes in the Printed Book Department, into a special copy of Pritzel's 'Thesaurus,' ed. II., which he then handed to Mr. Justen, of Dulau & Co., then in Soho Square, who took up the work of getting as many books as possible from home and foreign booksellers; the result being a library of the most extensive and valuable kind, which is still maintained by the Trustees.

Besides his activities in remodelling the Department, Mr. Carruthers in 1871 began his reports to the Royal Agricultural Society as their consulting botanist, on the germinative quality of seeds, plant pests, diseases, and the like, which he continued for 38 years, till 1909.

Elected a Fellow of the Linnean Society on the 7th February, 1861, he lived to be the senior Fellow but one, and was energetic in his services to the Society. He served repeatedly on the Council, 20 years in all, 12 of them as a Vice-President, and the period of 1886-90 as President, his term of office falling

during the hundredth anniversary of the foundation of the Society, and entailing much extra labour for its adequate celebration, which may be read in our Proceedings, 1888-89; on leaving the chair, he was a Vice-President for one year, the last time he served on the Council. Previous to this there was an unpleasant misunderstanding about certain proposals for altering certain Bye-laws, which Mr. Carruthers and others thought would be detrimental to the Society, which led to the then President, Mr. Bentham, abruptly quitting the chair on the 5th February, 1874; at a later meeting matters were adjusted amicably.

In 1889 Mr. Carruthers related his investigations into the portraits of Linnæus; two years later he visited the places where these portraits are preserved, his observations, as he himself said, "after too long an interval" were brought forward at the General Meeting of the 21st June, 1906, printed in our Proceedings, 1905-6, pp. 59-69, pls. 1-8, possibly hastened by the bicentenary festival in Sweden which took place in May 1907. For this Mr. Carruthers was the accredited representative of the Linnean Society, and the veteran of 77 was accompanied by the present writer, who had the gratification of being invited as a personal compliment. During this festival, the degree "honoris causa" of Doctor in the Faculty of Philosophy was bestowed upon Dr. W. Carruthers; he gave an account of his visit to a subsequent meeting of the Society.

After this his liking for science seems to have waned, but he still retained his affection for matters connected with the Presbyterian Church, and for which he edited the 'Childrens' Messenger' for forty-two years. Another subject was his keen interest in the likenesses of eminent Scottish scholars and theologians, especially George Buchanan and John Knox, upon which he published some notes.

The last years of his life he spent in the house of his elder son, Dr. William Carruthers, at Central Hill, Norwood; he died a few days after completing his 92nd year; and it was with keen regret that the writer only received an invitation to pay the last respects to his lifelong friend one day too late, owing to absence from home.

Dr. Carruthers married Jeanie, the eldest daughter of Wm. Moffatt, architect, in Edinburgh. He had two sons and one daughter by this marriage. The younger son died in Kuala Lumpur, and the elder one only survived his father.

In addition to the offices above recited, may be mentioned as borne by our late Fellow, F.R.S. in 1871, F.G.S. in 1867; President of the Geologists' Association in 1875-76, President of the Biological Section of the British Association in 1886, President of the Royal Microscopical Society in 1900-01. [B. D. J.]

By the death of WILLIAM COLE on the 27th June, 1922, the Society lost a notable Associate, and the Essex Field Club a devoted Secretary. He was born at Islington on the 11th of

February, 1844, the sixth son of Julius William Cole, of Kimberton, Huntingdonshire, a Trinity House official, and his wife Frances, granddaughter of John Love, of Crostwick Hall, North Walsham, Norfolk. His education was gained at various private schools, and from evening classes at King's College, Strand. In 1861, when 17, he entered the office of a shipbroker in Mark Lane. His father dying in 1865, the family moved, first to Islington from Tottenham, and next to Clapton, and William entered a barrister's chambers as shorthand writer, and remained five years, and then joined the staff of a newspaper in the same capacity.

Another removal in 1877 to Buckhurst Hill brought him into touch with Epping Forest, and in the beginning of 1880, the Essex Field Club was started. He had been elected member of the Entomological Society in 1873, which he retained to the end of his life; and F.L.S. on the 16th January, 1896, till 15th December, 1910, when he withdrew, and was elected an Associate on that date; this was following a nervous breakdown earlier in the year. A grant from the Royal Society, obtained through his old friend Raphael Meldola, enabled him to travel abroad, and produced an improvement in his health, but he aged perceptibly, and a return of his illness in 1916 was not to be shaken off, and he had to give up much of his activity. In 1919, by favour of some powerful friends, he was granted a Civil List Pension of £50 per annum, and with a further pension of £75 raised by friends, he was able to retire to St. Osyth. The Essex Field Club owes him a debt of gratitude for the unstinted service he gave during a long series of years to its interest; he seemed the personification of the Club.

We are indebted to a sympathetic obituary in the 'Essex Naturalist' for much of the information in the foregoing sketch, and in the same Journal, Oct. 1922-Mar. 1923, will be found a portrait of our late Associate. [B. D. J.]

HENRY JOHN ELWES, F.L.S., F.R.S.—Henry John Elwes was born on May 16th, 1846. He was educated at Eton, served five years in the Scots Guards, and thereafter devoted himself to horticulture, arboriculture, ornithology, entomology, travel, and sport.

In 1891 he succeeded to the estate of Colesborne in Gloucestershire, and there cultivated a great diversity of plants and trees. He had, in 1880, published a fine monograph on Lilies, and became a recognised authority on the genus, but he also cultivated tulips, crocuses, Nerines, and many species of succulents, some of which he had himself introduced.

A very active member, and at one time President, of the Royal English Arboricultural Society, he was responsible for the introduction of several trees into this country, amongst them two of the South American beeches—*Nothofagus antarctica* and *Nothofagus obliqua*, whilst of the Western American larch (*Larix occidentalis*) he was the first to obtain seed of any quantity.

Upwards of 80 plates in the 'Botanical Magazine' represent plants introduced or cultivated by him, the volume for 1877 was dedicated to him by Sir Joseph Hooker, the Editor, "as a tribute to the zeal, intelligence, and success with which you have pursued Horticultural Botany"; and it was chiefly to his initiative that the Magazine owes the fresh lease of life on which it has recently entered.

His great work 'The Trees of Great Britain and Ireland,' in seven volumes, published in collaboration with Prof. Augustine Henry, between 1906 and 1913, was the result of much patient research at home and of many journeys to various parts of the world, undertaken with indefatigable zeal to study the trees in their natural habitats. It is the most comprehensive compilation of its kind, and his name will probably be best remembered as its joint author.

But Elwes also won distinction in the fields of ornithology and entomology, becoming President of the Ornithologists' Union and of the Entomological Society. On both subjects he published many papers, and to the Natural History Museum he presented a fine collection of Lepidoptera. At one time he made a study of primitive breeds of sheep, and accomplished some valuable work in tracing the origin of various breeds. On this subject he published papers in the 'Scottish Naturalist' and other journals. At Colesborne he experimented with as many kinds as he could obtain. To the 'Proceedings' of the Zoological Society, of which he was a Fellow for 56 years, he contributed some fifteen papers on zoological and allied subjects.

He was elected a Fellow of the Linnean Society in 1874, and of the Royal Society in 1896. He was a member of Mr. Macaulay's Mission to Tibet in 1886, and after the Mission had been withdrawn, he explored a new route to that country in company with Mr. Prestage. These experiences drew him into association with Sir Joseph Hooker, with whom he formed a warm friendship, it was therefore fitting that he should be chosen to deliver the first Hooker Memorial Lecture at the Linnean Society in 1913. Much of the country he traversed was described in Hooker's 'Himalayan Journals,' and had not been visited since Hooker's time, though they have been since Elwes journeyed there.

It will be seen that Elwes was a man of very wide interests; the long list of papers under his name in the Royal Society Catalogue of Scientific Literature testifies to this; he was gifted with keen powers of observation, and great energy and tenacity of purpose. He maintained his activities until within a very short time of his death, which occurred at Colesborne on November 26th, 1922, in the 77th year of his age.

Endowed with a splendid physique and a commanding presence, Elwes made his mark wherever he went. He was a good linguist, always ready to communicate information and to assist those engaged in kindred pursuits. A man of strong feelings and

convictions, but with a character such that even those who differed from him most, could not but love and admire him.

Few have been able to command the opportunities or the means he enjoyed, fewer still have put them to better use. He was in the true sense an English gentleman, a sportsman, and a traveller, devoted to the pursuit of Natural Science.

[GERALD W. E. LODER.]

The following came before the Linnean Society:—

- 1881. 2 June. Indian-made Quinine shown "for" H. J. Elwes.
- 1898. 15 Dec. "Sketch of the Zoology and Botany of the Altai Mountains." J. Linn. Soc., Zool. xxvii. 1899, pp. 23-46, 5 figs.
- 1902. 6 Nov. "Notes on a Natural History Journey in Chile."
- 1913. 4 Dec. Lecture: "The Travels of Sir Joseph Hooker in the Sikkim Himalaya," with specimens, drawings, maps, and lantern slides. [1st Hooker Lecture.]

The MS. was delivered years later, when the second and third Hooker Lectures had been delivered and printed; it was then considered too late to print it.

[B. D. J.]

JOHN HENRY GURNEY, styled "The Younger," to distinguish him from his father of the same name, was born at Norwich on the 31st of July, 1848, a native of that county which since the days of Sir Thomas Browne has contributed so many to the ranks of naturalists; to name a few—the founders of the Linnean Society, Sir James Edward Smith was a Norwich man, John Lindley, Sir William Jackson Hooker, Dawson Turner, Alfred Newton, Henry Stevenson, and Thomas Southwell, shed lustre upon East Anglia. He joined the Zoological Society in 1868, two years later, the British Ornithologists' Union, and on the 3rd of December, 1885, he was elected a Fellow of our Society. Beginning in 1867 with an account of the Grey Phalarope in Great Britain during the autumn of the previous year, he published 'Rambles of a Naturalist in Egypt and other Countries' in 1876, followed by a 'Catalogue of the Birds of Norfolk' in 1884, reprinted from Mason's History of that county; and a 'Catalogue of the Birds of Prey in the Norwich Museum' 1894, a continuation of his father's volume in 1864. In local reports he was indefatigable, more than a hundred contributions to the county avifauna being credited to him. The year 1913 witnessed the production of his volume on 'The Gannet: a bird with a history,' with many illustrations and maps, which must remain a classic.

He was an original member of the Norfolk and Norwich Naturalists' Society, which was founded in 1869, and was its President for four terms, the last being in 1919-20. In 1876 he married Margaret Jane, daughter of Henry Edmund Gurney, a member of another branch of the family; at his death at Keswick Hall, near Norwich, after a short illness, on the 9th November, 1922, he left one son and three daughters.

[B. D. J.]

The Right Rev. Dr. SAMUEL TARRATT DE TERROT NEVILL, the first Bishop of Dunedin and Primate of New Zealand from 1904 to 1919, was born at Lenton, near Nottingham, on the 13th of May, 1837, the third son of Jonathan Nevill, lace and hosiery warehouseman, a house which afterwards became J. and R. Morley. The family descended from Hugh de Nevill, named the Lion, a benefactor of Lenton Abbey and owner of the land now forming the site of Nottingham. After leaving school our late Fellow entered his father's business, but feeling drawn to holy orders, entered St. Aidan's College, near Birkenhead, and in 1860, he was offered the curacy of Scarisbrick, Lancashire, where he stayed some years, and during that period married Mary Susan Cook Penny, daughter of James Penny, merchant, of Heavitree, near Exeter. One year later he became rector of Shelton, Staffordshire, where he found the church in ruins, and the parish in a most deplorable state of neglect, without schools or organizations of any sort, with the people sunk in moral degradation. During his tenure of the living he effected a remarkable change in the parish; he repaired the church, filled it with a congregation in place of the former half-dozen worshippers, and greatly improved the general state of things. While at Shelton, where he had four curates working under him, he went up to Magdalene College, Cambridge, where he took his B.A. in second class honours in the Natural Science Tripos in 1865, proceeding M.A. in 1868. Upon his election as Bishop of Dunedin he received the honorary degree of D.D. at Cambridge, and in 1906 became an Honorary Fellow of his old college.

He was elected Fellow of the Linnean Society on the 7th December, 1865, having in pursuit of palæontology dug in the coprolite beds of the Lower Greensand near Cambridge, where Saurian remains were plentiful; his other subjects for his degree were:—Physics, Comparative Anatomy, with Mineralogy and Crystallography as branches of Geology. Unfortunately for him, the Geological paper set had next to no questions on Palæontology, resulting in a second class only as stated above.

In 1870 he left Shelton Church in charge of his senior curate, and the Bishop of Lichfield (Selwyn) having granted him a year's leave of absence, Nevill and his wife paid a visit to New Zealand. During this visit the Rev. S. T. Nevill was unanimously elected Bishop of Dunedin, and was consecrated in the province, which was followed by a return to England in 1871, returning to his diocese in 1873, when strenuous labour became the usual occupation.

The constant exertions of the Bishop led to developments in organization, and amongst them to the building of St. Paul's Cathedral, the foundation stone being laid 8th June, 1915, and consecration took place on the 13th February, 1919, and shortly afterwards Bishop Nevill laid down his functions, after 48 years as Bishop, and 15 years as Primate of New Zealand.

After his retirement he spent his time in writing, especially his Diary, published after his death by his nephew, the Rev. Canon E. R. Nevill, M.A., Vicar of the Cathedral at Dunedin, in 1922. He died in the last week of October, 1921, and was buried on the 1st November.

The writer gratefully acknowledges the help in the above account of a singularly able and resourceful ecclesiastic, derived from Canon Nevill previously mentioned. [B. D. J.]

WILLIAM HENRY PEARSON, of Withington, near Manchester, was born in 1850, and was for nearly fifty years a yarn agent on the Manchester Royal Exchange, having the reputation of a sound man of business, but delighting in his hobby of studying Hepaticæ, in which he became an expert of wide fame. Dr. Carrington (1827-93) directed his attention to this group of plants and with him he issued in 1878-90, a set of specimens, and in 1902, his sumptuous work on British Hepaticæ saw the light. Continuing his researches, he extended his observations to exotic species, working up, amongst other collections, those gathered by Miss Eleonora Armitage in the West Indies, and those by Prof. R. H. Compton in 1914 in New Caledonia and the Isle of Pines. The latter was published in our Journal (Botany), vol. xlv. (1922), pp. 13-44, plates 2-4.

He received the Hon M.Sc. from the University of Manchester, for whose department of botany he had strenuously laboured; his election as an Associate of the Linnean Society dated from the 17th of January, 1907; he died on Thursday, 19th of April, 1923, and was buried in the Manchester Southern Cemetery. [B. D. J.]

FREDERIC NEWTON WILLIAMS was born at Brentford, Middlesex, on the 19th March, 1862. After his schooldays he studied medicine at University College and St. Thomas's Hospital, and after qualifying in 1883-1885, he settled in his native town as a medical practitioner. His nearness to Kew induced him to carry on his researches in systematic botany, and the writer's earliest remembrance of our late Fellow, was the sight of him with his head buried in a cabinet at Kew, containing herbarium specimens of *Dianthus*, a genus to which he was always partial. His early studies resulted in his little work 'Enumeratio specierum varietatumque generis *Dianthus*' [Brentæ Vadum, 1885]; followed in 1889 by his 'Notes on the Pinks of Western Europe,' London; and then by his ambitious paper in the Journal of this Society, "A Monograph of the genus *Dianthus*," issued in 1893. Two years later he printed his 'Provisional and tentative List of the Orders and Families of British Flowering Plants,' Brentford; a second edition appearing in 1898. That year he issued "A Revision of the genus *Arenaria*" in our Journal, and with the pecuniary help of the Royal Society, he produced 10 parts of his 'Prodromus Floræ Britannicæ,' Brentford, 1901-12. He then transferred his activities to a Swiss publication, the 'Bulletin de l'Herbier Boissier,'

there publishing "Liste des plantes connues du Siam" (1904-5), and his "Florula Gambica" (1907). These constitute his chief contributions to botany. A frequent attendant at our meetings and a diligent frequenter of our library, the news of his death came with startling suddenness to those who never expected a sudden end to his activities. [B. D. J.]

June 7th, 1923.

Dr. A. B. RENDLE, F.R.S., President,
in the Chair.

The Minutes of the Anniversary Meeting of the 24th May, 1923, were read and confirmed.

Mr. Norman Douglas Simpson and Prof. Robert Scott Troup, C.I.E., were admitted Fellows.

The President announced that he had appointed Dr. A. SMITH WOODWARD, Prof. E. S. GOODRICH, Mr. H. W. MONCKTON, and Dr. A. W. HILL, Vice-Presidents for the ensuing year.

Certificates in favour of Prof. Nalini Mohan Mukerjee, M.Sc., Basant Lal Gupta, M.Sc., and Lilian Alice Mabel, Lady Richmond-Brown were read for the second time.

Laurence Delaney Cleare, jun., Manaranjam Mitra, M.Sc., and Hans Theodor Güssow were proposed as Fellows.

The first paper was by Mr. H. SANDON: "Some Protozoa from the Soils and Mosses of Spitsbergen obtained by the Oxford University Expedition." (Communicated by D. Ward Cutler, M.A., F.L.S.)

Sir S. F. Harmer, K.B.E., F.R.S., inquired how the species were demonstrated; Lieut.-Col. J. H. Tull Walsh remarked on the food of the Protozoa, and Dr. G. P. Bidder spoke on the direction of movement of the Flagellates; the author replying to the questions put.

The second paper, by Dr. J. D. F. GILCHRIST on "A form of dimorphism and asexual reproduction in *Ptychodera capensis*," was explained by Sir S. F. Harmer, K.B.E., and Dr. G. P. Bidder added further observations.

Prof. C. E. Moss spoke on the species and forms of *Salicornia* in South Africa, illustrated by a series of dried specimens.

The President commented on the difficulty of studying succulent plants except when preserved in fluid, instancing Masson's spirit specimens of *Mesembryanthemum*, which were in the British Museum (Natural History) from the time of Sir Joseph Banks. Bt.

Mr. JAMES BRITTEN referred to the great amount of work done by Daniel Solander in the Banksian herbarium, but as most of the new names he gave to plants were not accompanied by any published description, they had been superseded by later authors.

Mr. J. BURTT-DAVY then gave his paper on the "Geographical Distribution of some Transvaal Leguminosæ," of which an abstract is given on p. 66.

Prof. Moss supported the abolition of the Kalahari Region as a botanical province. Mr. H. N. RIDLEY pointed out two sorts of endemics—the first, as in the case of *Didymocarpus*, a genus of sixty species in Malaya, with only one outlying species, each having been evolved in its proper region; and the second, endemics which were simply survivals of a lost flora. Mr. J. Burtt-Davy briefly replied.

Prof. Moss gave an account of the presence of velaminous roots in terrestrial orchids, especially noticeable in the orchid genus *Eulophia*, abundant at the Cape. Mr. H. N. Ridley and Mr. J. Ramsbottom, Sec.L.S., also spoke on the subject, and Prof. Moss replied.

Mr. J. RAMSBOTTOM exhibited specimens of *Choiromyces meandriformis*, White Truffle, from Chelmsford.

June 21st, 1923.

Dr. A. B. RENDLE, F.R.S., President,
in the Chair.

The Minutes of the General Meeting of the 7th June, 1923, were read and confirmed.

Mr. Robert Barr was admitted a Fellow.

Certificates in favour of Laurence Delaney Cleare, jun., F.E.S., Manaranjan Mitra, M.Sc. (Panj.), and Hans Theodor Güssow, were read for the second time.

Dr. Arthur Francis George Kerr and Ralph Terence St. John-Brooks, M.D., D.P.H., were proposed as Fellows.

The following were severally elected by ballot as Fellows:—

Miss Margery Knight, M.Sc. (Liverp.), Prof. Nalini Mohan Mukerjee, M.Sc., Basant Lal Gupta, M.Sc., Miss Joan Beauchamp Procter, F.Z.S., the Rev. William Charles Tippett, William Fawcett, B.Sc. Lond.; Charles Carmichael Arthur Monro, B.A. Oxon., Thomas Francis Egan, Lilian Alice Mabel, Lady Richmond-Brown, and Mrs. Nora Lilian Alcock.

Messrs. E. HERON-ALLEN, F.R.S., F.L.S., and A. EARLAND, F.R.M.S., presented a paper entitled “The Foraminifera of Lord Howe Island, South Pacific.”

Mr. A. EARLAND contributed a few supplementary remarks on the affinities of the new genera described in the paper and on the problems suggested by the occurrence of so many novel forms in a single locality. Dr. Calman commented on the exceptional beauty of the lantern-slides; Mr. Heron-Allen briefly replied.

Mr. T. A. DYMES spoke upon the “Seeds of the Marsh Orchids,” with lantern slides, coloured drawings by Mrs. Godfery, and living plants. He stated that the Marsh Orchids are classified in two main groups: (1) “*Maculatæ*”; (2) “*Latifoliæ*.”

The chief forms are:—*Maculatæ*: (a) *maculata* L. = *Fuchsii* Druce; (b) *ericetorum* Lint. = *præcox* Webst.; (c) *O'Kellyi* Druce; and *Latifoliæ*: (a) *prætermissa* Druce; (b) *incarnata* L.; (c) *purpurella* Steph. p. & f.

As all of these are described by characters taken from parts other than the seeds, it seemed advisable to examine their ripe seeds also.

The two main groups are easily separable by a single feature of the testal cells:—*Maculatæ*: testal cells sculptured (*i.e.*, with internal coils of thickening); *Latifoliæ*: testal cells not sculptured.

Other distinctions lie in the form of the testal cells and the breadth and thickness of their common walls.

Similarly the forms within each group are readily distinguishable by their seeds:—*Maculatæ*: (a) *maculata* L. = *Fuchsii* Druce, apex of testa curved and pointed, coils loose; (b) *ericetorum* Lint. = *præcox* Webst., kernel about 30 per cent. larger than in either of the other two forms, coils loose, less developed than in (a); (c) *O'Kellyi* Druce, a long, almost straight, narrow seed, with the coils close and pronounced. *Latifoliæ*: (a) *prætermissa* Druce, a long straight seed, not much dilated above the kernel, which is about the same breadth as the adjacent portion of the testa; (b) *incarnata* L., a much shorter and broader seed than (a), greatly dilated above the kernel which is distinctly narrower than the adjacent portion of the testa, the mesh of the testa smaller than in (a); (c) *purpurella* Steph. p. & f., the smallest of the three, testa dusky, indented on one or both sides above the kernel and tapering to a point, mesh small.

With regard to *Orchis latifolia* L., it is doubtful whether there is in this country anything so-called that is not a hybrid or a mongrel derived from two or more of the six forms already dealt with.

In striking contrast with the other forms, seeds from different or even from the same *O. latifolia* vary greatly in all the points which have been noted.

On the continent there is a form believed also to be British, referable to *Orchis majalis* Reichb., whose seeds appear to be uniform. They combine some of the characters of each group, but this does not necessarily spell hybridity, nor does their appearance suggest it.

It is possible that this form may be a now well-established hybrid-species of one of the Maculatæ with one of the Latifoliæ, or it may be the parent of both these groups.

That question, along with all those connected with the so-called *O. latifolia* L. in this country can, in the opinion of the author, be settled only by careful and extensive experiments in breeding.

Colonel GODFREY gave an account of the occurrence of certain of these forms abroad, especially in the case of those which did not grow associated with allied forms. The exhibitor replied.

Prof. A. DENDY, F.R.S., F.L.S., and Miss LESLIE M. FREDERICK presented a joint paper "On a Collection of Sponges from the Abrolhos Islands, Western Australia," Miss Frederick commenting on the forms by the aid of lantern-slides.

Dr. G. P. BIDDER congratulated Miss Frederick on her joining the somewhat restricted number of students of sponges, and upon the result of the work shown.

Dr. ETHEL N. MILES THOMAS followed with her "Observations on the Seedling Anatomy of the Genus *Ricinus*."

The interest of this communication lies in the discovery of a widespread feature of seedling anatomy, in conjunction with anatomical arrangements very diverse from those with which it is usually associated.

The passage from root to hypocotyl was briefly described in 1900 by Miss Edith Chick for *Ricinus communis* (Proc. Roy. Soc. Edin. xxii. (1900) pp. 117-129). She states that transition takes place entirely in the "root" as defined by the position of the collet, and that above the collet only stem structure is met with.

The present investigation establishes the presence of *alternate* or *root* xylem in the hypocotyl and cotyledons of several species of *Ricinus*, including *R. communis*. Moreover, it demonstrates that at an early stage the alternate or radial elements *alone* are lignified.

In spite of these new facts, however, Miss Chick's account remains substantially true in that the tissue groupings associated with root structure are only found low in the axis, while above the

collet eight stem bundles are to be found which are continued upwards as the four equally spaced bundles of the cotyledons. In addition, however, are to be found alternate xylem elements in the cotyledonary plane, *i. e.*, that passing through the centre of each cotyledon.

The existence, as well as the resorption, of these elements which are usually in direct continuity with the cotyledonary root poles, has now been established in a large number of dicotyledonary species, and was observed by Chauveaud so early as 1901, and by the writer independently in 1902. The extent of development and the amount of resorption varies with age, region, and species. In *Ricinus* very few elements are formed and much resorption occurs, so that their observation is difficult. The rapid elongation of the hypocotyl no doubt accounts for their frequent absence in the *basal* region of the hypocotyl.

The discovery of alternate xylem elements between the central bundles of the cotyledon of *Ricinus* proves the homology of these with the double bundle of *Mercurialis* and other forms as suggested by the writer in 1907 ("A Theory of the Double Leaf-trace founded on Seedling Structure"—'New Phytologist,' vi. (1907) pp. 77-91). It also negatives the view that the presence of alternate or centripetal xylem in the cotyledons is necessarily associated with "high" transition.

A long series of lantern-slides were shown in exemplification of the details described.

Dr. D. H. SCOTT, F.R.S., spoke, explaining that an error in his description of the early anatomy of the wallflower, *Cheiranthus Cheiri*, was due to the fact that the observations were founded upon material which had lost the structure now pointed out by Dr. Thomas.

The last paper was read in title; it was by Dr. C. H. O'DONOGHUE on Opisthobranchiata collected in the Abrolhos Islands, and was communicated by Professor W. J. DAKIN, F.L.S.

Two exhibitions followed, the first of some abnormal specimens of *Ranunculus acris* with small flowers and aborted stamens, sent by Mr. JOHN PARKIN from Cumberland, where they have been abundant this year. The second, by the President, of Fasciations of a *Crepis*, Ox-eye Daisy, and two states of the Foxglove, one having a terminal regular flower.

ABSTRACTS.

The Strobilus Theory of Angiospermous Descent.

By JOHN PARKIN, M.A., F.L.S.

[Read 15th March, 1923.]

THE author sees at present no sufficient reasons for abandoning or seriously modifying the theory of the origin of Angiosperms (Flowering Plants) brought before the Society in 1907 by the late Dr. Newell Arber and himself (5).

After this lapse of time it may not be without interest and one trusts profitable to re-state shortly the theory, to further elaborate it, and to review it in the light of work since accomplished bearing on it.

Re-statement. In the first place the theory is based on the idea that the Angiosperms constitute a monophyletic group. In the second place the cohort, Ranales, is held to contain families with the least modified flowers. In a general way, from such a type of flower as is, for example, possessed by some of the Magnoliaceæ all other flowers are considered to be derivable by reduction and modification. A hermaphrodite flower, in short, with its members indefinite in number, free from one another, borne spirally on a long axis and arranged in a definite sequence on this axis, viz., proceeding from below upwards first perianth members with no clear separation into sepals and petals, then stamens, and finally carpels. We may speak of such a derivation of all Angiospermous flowers as the *Ranalian hypothesis*—a hypothesis in the writer's opinion almost amounting to a generalisation.

A flower such as the above is to all intents and purposes a strobilus, but a strobilus of a special type to which we gave the name of *anthostrobilus* on account of its being characteristic of flowering plants. Such a strobilus is distinguished not only by being bisexual, but also by having its microsporophylls (stamens) invariably placed on the axis below (morphologically speaking) the megasporophylls (carpels), and further by having the whole of these fertile organs subtended by a number of sterile members constituting the perianth.

With the exception of the Angiosperms the only known plants which obviously possessed such a type of strobilus were the extinct Bennettitales. We therefore definitely put forward the view—Wieland and others had hinted at it—that of all known fossil plants this group was the most closely related to the Angiosperms. The peculiar and very reduced nature of the female part of the Bennettitean cone debarred tracing any *direct*

connection between it and the Angiospermous gynoecium, so we postulated a hypothetical group, the Hemiaugiosperms, as the direct ancestors, characterised by having open instead of closed carpels with the ovules marginally borne. We introduced the prefixes *pro* and *eu* to distinguish respectively the anthostrobilus with open carpels and that with closed carpels. The Angiosperms, then, as a whole, possess eu-anthostrobili and the Hemiaugiosperms pro-anthostrobili.

In a second joint paper (6) reasons were brought forward for regarding the individual "flowers" of the Gnetales as very reduced pro-anthostrobili, and we theorised to the effect that the existing members of this puzzling group might be held to be very aberrant survivors of the Hemiaugiosperms.

It is important to distinguish clearly between the two sides of the Strobilus Theory, viz.: what may be termed respectively the Bennettitalean and Ralanian sides. The Ralanian hypothesis can stand alone, even if the supposed Bennettitalean relationship were disproved. Some botanists apparently have failed to grasp this. To clinch my point I had myself discarded Engler's theory and embraced a Ralanian origin of Angiosperms some time before I was aware of the existence of the Bennettitalean fructification.

Possibly some botanists have been converted to the idea of a Ralanian derivation of Angiosperms by seeing in this view a plausible origin of Flowering Plants from ancestors akin to the Bennettitales. Realising the possibilities of the strobilus theory of the flower, they are not likely to return to the idea of the primitiveness of one consisting only of a single stamen or carpel, even if the supposed Bennettitalean relationship may have to be relinquished.

The Bennettitalean side. The crux of the strobilus theory as regards its Bennettitalean side centres round the anthostrobilus, that is to say, the sequence in which the sporophylls are borne on the axis of the cone. Invariably both in Angiosperms and Bennettitales the megasporophylls are borne on the axis above the microsporophylls. With the exception of the Gnetales (*Welwitschia*)—a case of especial significance—no other group of plants, fossil or recent, is known characterised by such a strobilus. All other Gymnosperms when cones are present have these unisexual. In *heterosporous* forms of the *Lycopsida*, however, bisexual cones appear to be the rule; but here we find that the relative position of the two kinds of sporophylls on the axis is the reverse of that in the anthostrobilus—the basal part of the cone being female and the upper male, e. g., *Calamostachys*, *Lepidostrobus*, *Selaginella*.

From the foregoing it becomes manifest that the type of cone possessed by the Bennettitales, and named by us the anthostrobilus, is at present unique among fossil plants. On the assumption that the Bennettitales have descended from Pteridospermous stock the question arises:—Has the anthostrobilus arisen from this plexus at more points than one? It may have, but in the existing state of our knowledge it is permissible to imagine that

it has evolved only once, and from it on the one hand diverged the Bennettitales and on the other the direct ancestors of the Angiosperms.

Let me now consider shortly the manner in which cones may have arisen from the loosely-arranged sporophylls met with in the Pteridosperms. Without speculating as to how originally the two kinds of sporangia were borne relative to one another on the Pteridospermous frond, it is safe to assume that eventually two kinds of spore-bearing fronds were evolved, viz., the mega- and microsporophyll. The massing together of such sporophylls into cones (strobili) can be conceived of as taking place in two ways. Either both kinds of sporophylls were aggregated into one and the same cone, producing the bisexual condition; or each kind was segregated apart, forming distinct male and female strobili. The Bennettitales evidently took the former course, and the Cycadales probably the latter. The arrangement of the megasporophylls in *Cycas* is difficult to reconcile with the view that the diclinism of the Cycads arose from an earlier hermaphrodite state through reduction.

Adopting the view of a Pteridospermous origin of all Gymnosperms, one may hazard the opinion that the ancestors of the Conifers were evolved from the Pteridosperms at a very early period by segregating their sporophylls into unisexual strobili. On this supposition the unisexual nature of their cone has not been due to reduction from a previous bisexual condition. There is no evidence to show that any of the Coniferales, including their forerunners, the Cordaitales, were ever other than unisexual. The Ginkgoales were probably another evolution from the same plexus which commenced on unisexual lines. Consequently, of all known Gymnosperms, extinct and extant, the Bennettitales and the Gnetales would appear to be the only groups to have possessed primitively bisexual cones.

In our joint paper we advanced the view that the rise of the Angiospermous type of anthostrobilus—the one with the closed carpel—was bound up with the substitution of entomophily for anemophily (5. p. 73). The writer is now inclined to extend this idea and to suggest that the anthostrobilus may have owed its origin to insect-visitation. Adopting the view that cross-fertilisation is of paramount importance in evolution, it follows that in the case of wind-pollinated plants it is an advantage in their passage to the strobilate condition to segregate the two kinds of sporophylls. The chances for cross-pollination will thereby be increased. Possibly this may have been the general trend in cone-formation among seed-plants in Palæozoic times before pollen-seeking insects appeared. Such a nutritive pabulum as pollen, one can imagine, would early attract primitive insects. In seeking it from the primitively unisexual Gymnosperms no advantage in the way of cross-fertilisation would accrue, as the female cones would not be visited. The Pteridosperms would on this supposition also be visited for pollen. They would potentially be

able to evolve in a direction capable of using insect-agency for the purpose of cross-pollination. This could be and may have been brought about by the aggregation of both kinds of sporophylls into one and the same cone.

It is not difficult to advance a reason why the anthostrobilus—the supposed insect-pollinated strobilus—has invariably the male sporophylls situated on the axis below the female. By this arrangement there would be less likelihood of self-pollination. In the reverse sequence pollen would be apt to fall on the ovules below. Further, it may be conjectured that a pollen-seeking insect would alight on the apex of the cone and, in the event of the microsporophylls being on the upper part of the strobilus, the megasporophylls below would not be traversed and no cross-pollination would ensue.

As regards the evolution of the anthostrobilus from the Pteridospermous arrangement of sporophylls, probably on a given axis a series of one kind of sporophyll (preferably male) was followed by a series of the other kind. A primitive anthostrobilus would result from such an axis ceasing further growth apically. Each batch of sporophylls may be imagined to have been protected by a series of bracts. The lower series became the perianth of the anthostrobilus. The upper series aborted as the two sets of sporophylls drew closer together on the axis, allowing the lower series to take on the protective function of both. The length of bare axis which separated the male and female parts of the cone in some Bennettitales may signify that the two kinds of sporophylls were originally some distance apart. It is tempting in this connection to see some ancestral significance in the gynophore of *Michelia*, a genus separated from *Magnolia* on account of possessing this feature.

At the time of the publication of our paper perhaps the weakest point in our theory lay in the lack of any similarity between the vegetative features of *Bennettites* and the Dicotyledonous tree. The former was so Cycadean in leaf and stem as to bear no resemblance to the latter, and had besides apparently axillary fructifications. We postulated a solitary flower as a primitive Angiospermous character, and the writer has shown since (38) that this was probably borne terminally to a leafy shoot. Now a striking feature brought to the front in recent years respecting Bennettitalean genera other than *Bennettites* (Cycadeoidea) itself resides in the fact that the strobili were borne terminally. Such cones occurred in *Williamsonia*, *Wielandiella*, and *Williamsoniella*. Further, the vegetative features of the above three genera had other points in common with the Dicotyledonous tree. The following may be mentioned:—(1) Marked internodes; (2) slender stems; (3) free branching; and (4) small foliage leaves. The evolution of the Dicotyledonous tree-habit from that of the Pteridosperm is thus rendered less improbable. The Bennettitales went part of the way only, the Hemiangiosperms on parallel lines the full way.

When our theory was promulgated it no doubt appeared a big step to assume that the Angiospermous stamen was derived by means of extreme reduction from a pinnate frond-like microsporophyll, such as occurred in *Bennettites*. Now we know that in the Bennettitalean line great reduction has apparently taken place in this member. Attention is directed especially to the microsporophyll of *Williamsoniella coranta*, which may carry only two pairs of synangia (53. p. 119). Using this as a parallelism, it is not an improbable assumption that the reduction has been carried a stage or two further in the Angiospermous line, resulting in the stereotyped stamen with its pair of bilocular synangia.

In our paper attention was drawn to the importance of the fact that in the Magnoliaceæ the connective is prolonged beyond the anther as a sterile tip (5. p. 48). This vestige, as we believed it to be, suggests comparison with the sterile pointed extremity of the Bennettitean microsporophyll. At any rate this protrusion of the connective beyond the anther may point to the fact that in the Angiospermous line of descent the anther had not originally an apical position, but that in the course of evolution it has been left so through the sterile terminal portion of the stamen aborting.

The additional knowledge acquired in recent years auent the Bennettitalean fructifications has not enlightened us in the least as to the true nature of the female part of the cone. This structure is built up essentially the same in all forms. The simplest view to take is to regard the interseminal scale and seed-pedice as homologous, and this is the one the writer at present is inclined to favour (45, & 53. p. 139). It is a "far cry" from the seed-bearing frond of the Pteridosperm to the seed-pedice of *Bennettites*; but keeping in mind the great reduction which has apparently taken place in the corresponding male frond, it is not impossible that this pedice may represent the female frond reduced to its lowest term, viz., to a single stalked ovule.

Gnetales. One of the merits of the strobilus theory is apparent in the fact that it finds provisionally a resting-place for this puzzling group. We regarded them as a much modified remnant of an assemblage of plants which left the main stem before this had reached the Angiospermous level. A number of papers dealing with the *Gnetales* have appeared since, notably from the pen of the late Prof. Pearson. After a careful perusal of these I fail to find any new facts which render our standpoint untenable. Recent work tends rather to accentuate their relationship to the Bennettitales, and to bring them nearer to this fossil group than we were inclined to do (cf. 11, 48, 52).

The male flower—morphologically hermaphrodite—of *Welwitschia* seriously interferes with the endeavour to derive the *Gnetales* directly from the Conifers. Thompson (55) tries this once more, but, finds this flower inconveniently in the way. Likewise attempts to connect the *Gnetales* with the *Amentales* through floral structure or with the *Piperales* through supposed

gametophytic similarities fail to be convincing. Here, I think, we merely have superficial resemblances of no phyletic significance.

Both Pearson (39. pp. 334 & 340) and Thompson (55. p. 150) are inclined to regard the terminal (cauline) ovule as primitive and raise anew what we had hoped was an out-of-date controversy. On the strobilus theory the cauline ovule presents no puzzle. Primitively from Pteridosperms onwards the ovule was leaf-borne. In the case of a pro-anthostrobilus in which both carpels and ovules have been reduced to unity and the carpellary-leaf to vanishing point, then through stress of circumstances the solitary ovule becomes pressed into the terminal position and may for descriptive purposes be termed cauline. It occupies the place of a terminal bud, but it cannot be considered as such, nor can it be regarded phyletically as of cauline origin. Such reasoning applies to the solitary terminal ovule of the Gnetales. In the Angiospermous flower a terminal cauline ovule can result from a syncarpous gynoecium becoming reduced to a single ovule, but in this case naturally some carpellary structure remains to enclose the developing seed.

The Angiosperms a monophyletic group. The writer is under the impression that at the present time the majority of botanists regard the Angiosperms as a natural, that is to say a monophyletic, group. This view has only become prevalent in recent years. As late as 1911 Prof. Weiss favoured a polyphyletic origin (57. p. 556).

Notwithstanding the wide differences in floral structure the two following striking features render to my mind the monophyletic standpoint well-nigh unassailable:—

(1) The stereotyped nature of the embryo-sac.

(2) The same type of microsporophyll throughout the group.

Even admitting the possibility of the Angiospermous embryo-sac as having arisen independently more than once, the chance of its being associated each time with the same kind of microsporophyll would be extremely unlikely.

The monophyletic view could be based on other grounds, such as vascular anatomy. Respecting those touching the flower, the acceptance of the Ranalian hypothesis would be involved. Let the monophyletic origin be conceded, then the only rational way of explaining the evolution of the flower is by this hypothesis.

Amentiferae. Those botanists who reject the application of the reduction theory to the flower of the Amentiferae appear to be on the horns of a dilemma. They must either accept a polyphyletic (or at least a diphyletic) origin for Angiosperms, or else must show how to derive the bisexual from the unisexual flower.

What evidence is there for the view that the hermaphrodite flower has evolved from the unisexual one? Professor Weiss rejects the application of the reduction idea to the Amentales on account of this group possessing "certain characters which appear to me to be undoubtedly primitive" (57. p. 556). The

characters he mentions either had then or have since been shown to be not peculiar to the Amentales; but the point I wish here especially to criticise concerns the origin of the hermaphrodite flower. Evidently he is of the opinion that in the phylogenetic sense a unisexual strobilus can revert to the bisexual state, and he cites in his support the occurrence of androgynous cones in the Coniferae. These in my estimation have merely a teratological significance. This may seem to be begging the question, so I state my argument as follows. Until a new species of (say) *Pinus* be discovered, which normally bears androgynous cones and which is except for this peculiarity a true pine, I decline to attach any phylogenetic importance to these freakish cones. Evidence has yet to be produced to show that a species with hermaphrodite cones or flowers has ever arisen from one bearing unisexual fructifications. For the converse, the evidence is overwhelming.

Viewed in the light of our theory the origin of the hermaphrodite flower or cone presents no difficulty. The two kinds of sporophylls are regarded as caught up together into one and the same strobilus from the lax Pteridospermous arrangement. The unisexual condition has resulted from the abortion of one kind of sporophyll in the strobilus. The Englerian can, of course, maintain that the Amentiferae have been unisexual from the beginning; but then he must confess to at least a diphyletic origin for Angiosperms, and must refrain from formulating any direct relationship between the catkin-families and hermaphrodite flowering plants. But this he declines to do. Engler's system, in fact, is based on a kind of general and hazy idea that naked unisexual flowers of few parts are primitive, and that from these have gradually emerged by a series of steps the fully-equipped hermaphrodite flower with both calyx and corolla. No attempt is made to trace by means of examples how this evolution has come about.

Let us briefly glance at the families which may now be considered to compose the Amentiferae. The Salicales can no longer be included. The group then is narrowed down to the Englerian cohorts, Juglandales, and Fagales, with the addition of *Casuarina*. There is a general consensus of opinion that *Casuarina* is fairly closely related to the Betulaceae (12, 25). There are also reasons for regarding the Juglandales as having affinities with the Fagales. Hemsley's new family, the Julianiaceae (23), was looked upon for a time as a link between the Juglandaceae and the Anacardiaceae; but probably the Julianiaceae should more correctly be considered as merely reduced Anacardiaceous forms with no real relationship to the Juglandales (19). A Rosalian origin for the Amentiferae as a whole would appear to be the more plausible view. There may be some element of truth in Hallier's original suggestion of deriving the catkin-families from the Trochodendraceae through the Hamamelidaceae.

In recent years perhaps most stress has been laid on the structure of the wood as pointing to the primitiveness of the

Amentiferæ. Prof. Jeffrey (28, p. 384) makes much capital of this in opposing the Ralian standpoint. The two characters of the wood chiefly concerned bear on the nature of the perforations of the vessels and on the composition of the medullary rays. He is careful to dwell on the fact that scalariform perforations characterise the wood of *Casuarina* and the Fagales; but refrains from laying stress also on their abundance in the arborescent Ranales! Bailey and Sinnott (7) have advanced serious objections to Jeffrey's aggregate ray theory, upon which the supposed primitiveness of the medullary ray in the Amentiferæ rests.

The view that of all Dicotyledons certain of the Amentiferæ have the least evolved type of wood is weakened by the fact that some of the Ranales, viz., *Drinys*, *Zygogynum*, *Trochodendron*, and *Tetracentron*, are lacking in true vessels. Jeffrey dismisses the matter in rather an arbitrary fashion by imagining that the vessels have disappeared (28). These forms are woody plants, and if vessels had once been present one wonders what can have led to their suppression.

Monocotyledons. It is now the prevailing opinion that Monocotyledons have descended from Dicotyledons, that is to say that their ancestors had two cotyledons. Except the cotyledonary distinction there is no fundamental feature of difference between the two groups. Some years ago the absence of cambium in Monocotyledons might have been held as fundamental, but in the light of recent work (2) this deficiency has no or slight phyletic value. The geophytic or aquatic origin of Monocotyledons explains the loss of this cambium, and the arborescent types, such as palms, can be regarded in the light of new evolutions, in which the tree-habit has been regained by the adoption of fresh means of attaining stem-rigidity. This habit, broadly viewed, is primitive to the herbaceous in Dicotyledons, but the reverse may be considered to hold in the case of the Monocotyledons.

It must be conceded on geological evidence that the Monocotyledons are an old assemblage of flowering plants, and they must perforce have left the Dicotyledonous line of descent at an early period. The question naturally arises, are they mono- or polyphyletic respecting their derivation from Dicotyledons? Though no satisfying answer can yet be given to this question, the writer sees no cogent reason for regarding the group as other than monophyletic and of possible Ralian extraction. The floral features in common between the Helobiæ on the one hand and the Ranales (especially certain of the Nymphaeaceæ) on the other hand suggest something deeper than mere parallelism. The supposed connection between the Piperaceæ and the Araceæ, based originally by Campbell on gametophytic resemblances and later by A. W. Hill on the presence of heterocotly in *Peperomia*, does not appeal to the writer, because in both cases it is forcing an affinity between highly evolved rather than between primitive members of these families.

The problem of the true nature of the single cotyledon of Monocotyledons is still unsolved, but Coulter and Land's contribution to the question (17) may go some way towards the solution. They conclude from a study of *Agapanthus* that cotyledons are always lateral structures and that the single one is due to the growth being concentrated into one rather than two primordia.

Respecting the relative merits of an aquatic or geophilous ancestry for Monocotyledons, the two views may be somewhat reconciled by regarding the earliest ones as neither markedly aquatic or extremely geophilous— in fact, marsh plants with stout rhizomes. Some of their descendants have become completely hydrophytic, others sharply geophytic, while others again have retaken to the arborescent habit by fresh means.

Ovule. The absence of the orthotropous ovule in the Ranales might be advanced as an objection to our theory, especially as it occurs in families considered primitive by the Englerians. This, of course, is on the assumption that orthotropy is primitive for Angiosperms. There is now reason to doubt this. It has been shown for example in the case of *Juglans* (10. p. 628) and *Ulmus* (9) that their ovules commence their development as anatropous ones and gradually assume the orthotropous form. Other cases of orthotropy among Angiosperms deserve investigation from this point of view.

Embryo-sac. On account of the meagre variation in the embryo-sac of flowering plants, little, if any, use can be made of it in determining relationships within the group. That of *Peperomia* was taken for a time as showing primitiveness, but this can hardly any longer be maintained. The writer is inclined to regard the 8-nucleate sac as primitive for Angiosperms and any departures therefrom as derived (47. p. 385). There is little hope of finding among existing flowering plants a sac less reduced.

Since *Welwitschia* and *Gnetum* are the only Gymnosperms which do not form definite archegonia in their embryo-sacs, it is tempting to compare their sacs with that of the Angiosperm. That they form an interesting parallelism to that of the flowering plant and are suggestive of the way the latter has evolved from the Gymnospermous sac may be conceded; but that these Gnetalean embryo-sacs are phyletically connected with that of the Angiosperm is to me improbable. Pearson (39. p. 378) attempted to connect them so, using that of *Peperomia* as a link. As already mentioned this sac can no longer be upheld as primitive. Besides there are grave difficulties in the way of connecting phyletically the Gnetales with the Piperales by using the highly evolved genus, *Peperomia*, as an intermediary.

Engler's System. Engler's system, an elaboration of that of Eichler's, which ousted largely but not wholly Bentham and Hooker's founded on that of the French school of taxonomy, has had a considerable reign, and it is high time for the sake of progress in the study of the flower that it should no longer be blindly followed, but critically examined with the view of the adoption of

a new system of classification embracing the best features of both schools. There is no gainsaying the fact that Bentham and Hooker's system, which was modelled on that of De Candoille, is out of date, but two or three of its main features may justify maintenance. These are:—(1) The retention of the Ralian families at the commencement of the Angiosperms; (2) the placing of the Dicotyledons as a whole in front of the Monocotyledons; and perhaps (3) the retention of the time-honoured triple division of the Dicotyledons founded on the corolla. In the Ranales we not only have a preponderance of primitive floral features from the standpoint of the strobilus theory, but also indications of most of the main modifications of the flower, which became characteristic for other groups. As the Monocotyledons are now generally considered to have sprung from Dicotyledonous ancestors, they should certainly follow, and not precede, as Engler has them, the Dicotyledons. The series, Polypetalæ, Sympetalæ, and Apetalæ or their equivalents, may not as yet have outlived their usefulness as convenient sub-divisions of the Dicotyledons, provided we guard against attributing to them any monophyletic signification. The Polypetalæ may be viewed as polyphyletic from the Ranales or Pro-Ranales if preferred, and the Sympetalæ are doubtless so from the Polypetalæ. The retention of the Apetalæ would only be justifiable on the grounds of our inability to connect such forms with Polypetalous cohorts. Instead of forcing relationships it might be convenient as a temporary measure to keep a third series for such families, whether it be called Apetalæ, Incompletæ, Monochlamydeæ, or by some other less committal name.

De Candolle was the first to commence a linear sequence with Ralian families, and Bentham and Hooker followed suit. These systematists failed, however, to perceive in this any phylogenetic significance*. Systematic botany was, and still is to some extent dominated by the idea of the 5-whorled pentamerous flower constituting the ground-plan of the majority of Dicotyledonous flowers; and the principles of doubling, splitting, and branching have been too freely invoked to account for members in the whorls greater than five. By adopting the Ralian theory there is no need to press the matter in this fashion. Unless the balance of evidence is strongly on the other side, it is more natural to assume a sign of primitiveness in many membered whorls. Let it be clearly understood that there is no desire to infer that there have been no cases of increase in floral members by splitting and the like. I withhold judgment, only emphasising the necessity of re-studying all such apparent instances by the help of the strobilus theory. Many obscure points in floral structure, in my opinion

* See in this connection a letter dated May 13th, 1907, from Sir J. D. Hooker to Dr. Newell Arber, reproduced in 'Life and Letters of Sir J. D. Hooker' by Leonard Huxley, London, 1918, vol. ii, p. 22.

will vanish. The Ranalian families to the older systematists were somewhat of a stumbling block, as their flowers were difficult to harmonise with the formal flower of alternating whorls. To those who embrace the anthostrobilate theory of the flower, these families instead of mystifying supply the key to the whole. Indefiniteness in all parts of the flower is what we are on the watch for and requires no explaining away.

Engler's system really owed its origin to a praiseworthy effort initiated by Brongniart to abolish the Apetalæ. The latter recognised that most apetalous flowers were reductions from polypetalous types, and should therefore be capable of being intercalated among the Polypetalæ. Instead of keeping strictly to this progressive idea and at the same time retaining the Ranales at the commencement of the sequence, Engler and his school diverged on novel lines, postulating the primitiveness of the unisexual flower without, or with merely a sepaloid, perianth. He passes from such forms to families possessing a uniseriate petaloid perianth, and then to ones with a definite calyx and corolla. Superficially the system appears so far to run smoothly; but now comes the weak link in the chain—the Ranalian families have to be inserted. They break the progressive nature of the sequence with their indefinite perianth. Without them the gradual perfecting of the biseriate perianth would have followed through the polypetalous families up to the Sympetalæ. The Ranales stand inconveniently in the way, just as they did with the old formalists. A linear arrangement of families is, of course, merely a makeshift, but at the same time an unavoidable one. As far as possible it should follow evolutionary lines, and after that its practical value should be consulted. Engler's system in the writer's opinion fails to fulfil the first condition, and granting this there is no reason in retaining it on the second account, for it is no improvement on Bentham and Hooker's arrangement from the practical point of view. It is a matter of regret that certain recent English systematic publications have been arranged on Englerian lines, thus departing from the long continued practice of commencing British floras with the Ranunculaceæ.

It is interesting to note in the history of taxonomy that each big forward move has usually been accompanied by a step backwards. Engler's system will prove no exception. The forward move consists in a better grouping of the families into cohorts (orders), and the backward step in allowing the catkin-families to usurp the place previously occupied by the Ranales.

The German school of taxonomy, associated with Treub's classical work on *Casuarina*, has had, however, this merit. Attention became focussed on the Amentiferous families with the hope of establishing their primitiveness, of elucidating the nature of the Angiospermous embryo-sac and of connecting them phyletically with the Gnetales, thus affording a real clue as to the origin of flowering plants. None of these expectations have been

realised. Surely as the key to the origin of the flower appears not to lie in this direction, it is time the attack was turned elsewhere, viz., to the Ranaian families and especially to the arborescent ones.

As a stimulus to research Engler's system may then be said to have outlived its usefulness and to have now a stultifying influence on the study of the flower (20). The strobilus theory, on the other hand, provides a perfectly intelligible working hypothesis with which to approach this study. It has never yet been put sufficiently to the test to see how far it will carry us, though it is evident that a commencement has now been made in this direction (27).

In conclusion, I take this opportunity of expressing my thanks to Dr. D. H. Scott, F.R.S., for much helpful criticism and for many kindly suggestions, especially in respect to the palæobotanical side of this paper.

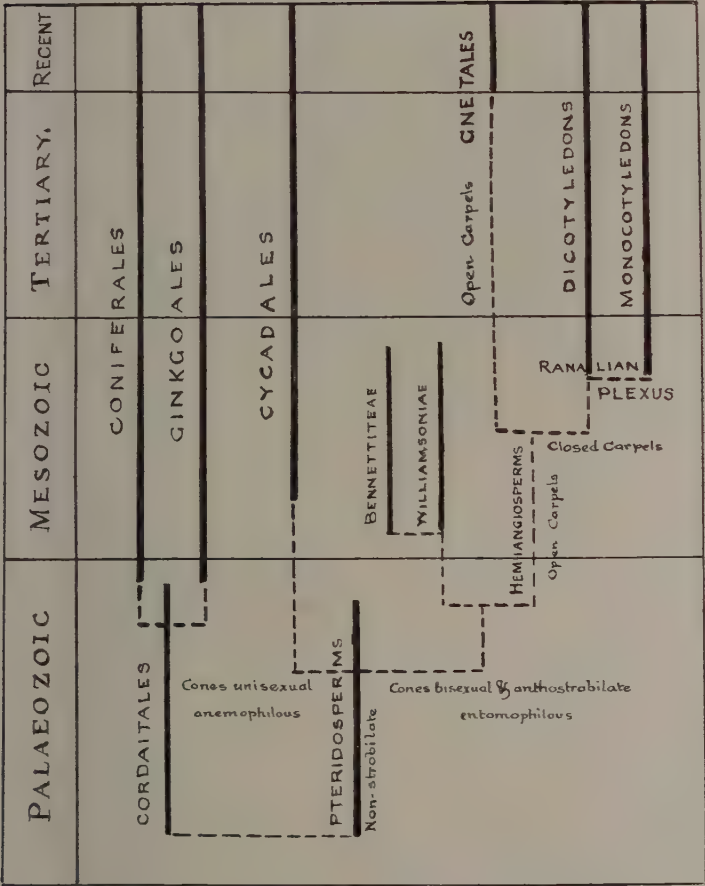
BIBLIOGRAPHY.

(From 1907 onwards.)

1. ARBER, A. (1918).—The Phyllode Theory of the Monocotyledonous Leaf, with Special Reference to Anatomical Evidence. *Ann. Bot.* xxxii. pp. 465–501; also to a series of papers since supporting the phyllode theory.
2. ARBER, A. (1919).—Studies on Intrafascicular Cambium in Monocotyledons. *Ann. Bot.* xxxiii. pp. 459–465, and (1922) *Ann. Bot.* xxxvi. pp. 251–256.
3. ARBER, A. (1920).—Water Plants, Cambridge, pp. i–xvi and 1–436.
4. ARBER, the late E. A. N. (1919).—Remarks on the Organization of the Cones of *Williamsonia gigas* (L. & H.). *Ann. Bot.* xxxiii. pp. 173–179.
5. ARBER, E. A. N., and J. PARKIN. (1907).—On the Origin of Angiosperms. *Journ. Linn. Soc., Bot.* xxxviii. pp. 29–80. Translated into German in *Oesterreich. Bot. Zeitschrift*, lviii. pp. 89, 133, 184 (1908).
6. ARBER, E. A. N., and J. PARKIN. (1908).—The Relationship of the Angiosperms to the Gnetales. *Ann. Bot.* xxii. pp. 489–515.
7. BAILEY, I. W., and E. W. SINNOTT. (1914).—Investigations on the Phylogeny of the Angiosperms, No. 2. Anatomical Evidence of Reduction in certain Amentiferæ. *Bot. Gaz.*, lviii. pp. 36–58.
8. BAILEY, I. W., and W. P. THOMPSON. (1918).—Additional Notes upon the Angiosperms, *Tetracentron*, *Trochodendron*, and *Drimys*, in which Vessels are absent from the Wood. *Ann. Bot.* xxxii. pp. 503–512.
9. BECHTEL, A. R. (1921).—The Floral Anatomy of the Urticales. *Amer. Journ. Bot.* viii. pp. 386–410.
10. BENSON, M., and E. J. WELSFORD. (1909).—The Morphology of the Ovule and Female Flower of *Juglans regia* and of a few allied genera. *Ann. Bot.* xxiii. pp. 623–633.
11. BERRIDGE, E. M. (1911).—On some points of resemblance between Gnetalean and Bennettitean seeds. *New Phytologist*, x. pp. 140–144.
12. BERRIDGE, E. M. (1914).—The Structure of the Flower of *Fagacæ*, and its bearing on the affinities of the Group. *Ann. Bot.* xxviii. pp. 509–526.

13. BESSEY, C. E. (1915).—The Phylogeny and Taxonomy of Angiosperms. *Ann. Missouri Bot. Gard.* ii. pp. 109–164.
14. BLISS, M. C. (1921).—The Vessel in Seed Plants. *Bot. Gaz.* lxxi. pp. 314–326.
15. BOWER, F. O. (1914).—The Presidential Address (Section K) British Association, Australia Meeting, Annual Report, see p. 569.
16. CHURCH, A. H. (1914).—On the Floral Mechanism of *Welwitschia mirabilis* (Hooker). *Phil. Trans. B.* ccv. pp. 115–151.
17. COULTER, J. M., and W. J. G. LANG. (1914).—The Origin of Monocotyledony. *Bot. Gaz.* lvii. pp. 509–519.
18. DE FRAINE, E. (1910).—The Seedling Structure of certain Cactaceæ. *Ann. Bot.* xxiv. pp. 125–175.
19. FRITSCH, F. E. (1908).—The Anatomy of the Julianiaceæ considered from the Systematic Point of View. *Trans. Linn. Soc., Bot.* vii. pp. 129–151.
20. GIBSON, R. J. H. (1919).—Outlines of the History of Botany, London, see p. 258.
21. HALLIER, H. (1908).—Ueber Juliania u. d. wahren Stammeltern d. Kätzchenblätter. *Dresden*, pp. 1–210.
22. HALLIER, H. (1912).—L'origine et le système phylétique des Angiospermes exposés à l'aide de leur arbre généalogique. *Archives Néerland. Sér. III. B (Sci. Nat.), T. i.* pp. 146–234.
23. HEMSLEY, W. B. (1907).—On the Julianiaceæ: A new Natural Order of Plants. *Phil. Trans. B.* cxcix. pp. 169–197.
24. HENSLow, G. (1911).—The Origin of Monocotyledons from Dicotyledons, through Self-Adaptation to a Moist or Aquatic Habit. *Ann. Bot.* xxv. pp. 717–744.
25. HOAR, C. S. (1916).—The Anatomy and Phylogenetic Position of the Betulaceæ. *Amer. Journ. Bot.* iii. pp. 415–534.
26. HORNE, A. S. (1914).—A Contribution to the Study of the Evolution of the Flower, with special reference to the Hamamelidaceæ, Caprifoliaceæ and Cornaceæ. *Trans. Linn. Soc., Bot.* viii. pp. 239–309.
27. HUTCHINSON, J. (1923).—Contributions towards a Phylogenetic Classification of Flowering Plants, I. *Kew Bulletin*, no. 2, pp. 65–89.
28. JEFFREY, E. C. (1917).—The Anatomy of Woody Plants, Chicago.
29. KERSHAW, E. M. (1909).—Note on the Relationship of the Julianiaceæ. *Ann. Bot.* xxiii. pp. 336–337.
30. KERSHAW, E. M. (1909).—The Structure and Development of the Ovule of *Myrica Gale*. *Ann. Bot.* xxiii. pp. 353–362.
31. KERSHAW, E. M. (1909).—Further Observations on the Structure of the Ovules of Myricaceæ and allied groups. *Ann. Bot.* xxiii. p. 692.
32. LEE, E. (1912).—Observations on the Seedling Anatomy of certain Sympetaleæ. *Ann. Bot.* xxvi. pp. 727–746.
33. LIGNIER, O., et A. TISON. (1912).—Les Gnétales: leurs Fleurs et leur Position Systématique. *Ann. d. Sci. Nat., Bot.* (9) xvi. pp. 55–185.
34. LIGNIER, O., et A. TISON. (1913). L'ovule tritegumenté de *Gnetum* est probablement an axe d'inflorescence. *Bull. Soc. Bot. Fr.* x. pp. 64–72.
35. MACDUFFIE, R. C. (1921).—Vessels of the Gnetalean type in Angiosperms. *Bot. Gaz.* lxxi. pp. 438–445.
36. MANEVAL, W. E. (1914).—The Development of *Magnolia* and *Liriodendron*, including a discussion of the primitiveness of the Magnoliaceæ. *Bot. Gaz.* lvii. pp. 1–31.
37. M[OSS], C. E. (1912).—Modern Systems of Classifications of the Angiosperms. *New Phytologist*, xi. pp. 206–213.
38. PARKIN, J. (1914).—The Evolution of the Inflorescence. *Journ. Linn. Soc., Bot.* xlii. pp. 511–563.
39. PEARSON, H. H. W. (1909).—Further observations on *Welwitschia*. *Phil. Trans. B.* cc. pp. 331–402.
40. PEARSON, H. H. W. (1915).—Notes on the Morphology of certain Structures concerned in Reproduction in the genus *Gnetum*. *Trans. Linn. Soc., Bot.* viii. pp. 311–332.

41. SARGENT, E. (1908).—Reconstruction of a Race of Primitive Angiosperms. *Ann. Bot.* xxii. pp. 121-186.
42. SCOTT, D. H. (1909).—Presidential Address, *Proc. Linn. Soc.* pp. 21-31.
43. SCOTT, D. H. (1909).—Studies in Fossil Botany, 2nd Edit. vol. ii. London.
44. SCOTT, D. H. (1920).— " " 3rd Edit. vol. i. London.
45. SEWARD, A. C. (1913).—A Petrified *Williamsonia* from Scotland. *Phil. Trans. B. cciii.* pp. 101-123.
46. SINNOTT, E. W., and I. W. BAILEY. (1914).—The Origin and Dispersal of Herbaceous Angiosperms. *Ann. Bot.* xxviii. pp. 547-600.
47. STEPHENS, E. L. (1909).—Recent Progress in the Study of the Embryosac of the Angiosperms. *New Phytologist*, viii. pp. 377-387.
48. SYKES, M. G. (1911).—The Anatomy and Morphology of the Leaves and Inflorescences of *Welwitschia mirabilis*. *Phil. Trans. B. cci.* pp. 179-226.
49. TÄCKHOLM, G., u. E. SÖDERBERG. (1918).—Ueber die Pollenentwicklung bei *Cinnamomum*. *Arkiv Bot.* xv., Stockholm, n. 8.
50. THODAY (SYKES), M. G. (1911).—The Female Inflorescence and Ovules of *Gnetum africanum*, with notes on *Gnetum scandens*. *Ann. Bot.* xxv. pp. 1101-1135.
51. THODAY SYKES, M. G., and E. M. BERRIDGE. (1912).—The Anatomy and Morphology of the Inflorescence and Flowers of *Ephedra*. *Ann. Bot.* xxvi. pp. 954-985.
52. THODAY, M. G. (1921).—Anatomy of the Ovule and Seed in *Gnetum Gnemon*, with notes on *Gnetum funiculare*. *Ann. Bot.* xxxv. pp. 37-53.
53. THOMAS, H. H. (1916).—On *Williamsoniella*, a New Type of Bennettitalean Flower. *Phil. Trans. B. ccvii.* pp. 113-148.
54. THOMAS, H. H., and N. BANCROFT. (1913).—On the Cuticles of some recent and fossil Cycadean Fronds. *Trans. Linn. Soc., Bot.* viii. pp. 155-204.
55. THOMPSON, W. P. (1916).—The Morphology and Affinities of *Gnetum*. *Amer. Journ. Bot.* iv. pp. 135-184.
56. THOMPSON, W. P. (1918).—Independent Evolution of Vessels in Gnetales and Angiosperms. *Bot. Gaz.* lxx. pp. 83-90.
57. WEISS, F. E. (1911).—Presidential Address (Section K) British Association, Portsmouth Meeting, Annual Report, pp. 550-562.
58. WERNHAM, H. F. (1913).—Floral Evolution; with Particular Reference to the Sympetalous Dicotyledons, Cambridge. (Reprinted from *New Phytologist*, vols. xi. and xii. 1911 and 1912.)
59. WIELAND, G. R. (1914).—Was the *Pterophyllum* Foliage transformed into the Leafy Blades of Dicotyls? *Amer. Journ. Sc.* xxxviii. pp. 451-460.
60. WIELAND, G. R. (1914).—La Flora Liasica de la Mixteca Alta. *Boletín 31 del Instituto Geológico de Mexico.*
61. WIELAND, G. R. (1916).—American Fossil Cycads, vol. ii. Carnegie Institution of Washington.
62. WIELAND, G. R. (1919).—Classification of the Cycadophyta. *Amer. Journ. Sc.* xlvii. pp. 391-406.
63. WIELAND, G. R. (1920).—Distribution and Relationships of the Cycadeoids. *Amer. Journ. Bot.* vii. pp. 154-171.
64. WIELAND, G. R. (1921).—Monocarpy and Pseudomonocarpy in the Cycadeoids. *Amer. Journ. Bot.* viii. pp. 218-230.



The above table reproduces in graphic form the views expressed in the foregoing paper. The unbroken vertical lines represent approximately the geological records of the plant-groups in question, and the broken lines the suggested phylogenetic connections between these groups. The distance apart of the vertical lines from one another indicates roughly the supposed degree of lateral relationship between the groups, which are all supposed to have originated from the Pteridosperms. To the left of the Pteridospermous line are shown those Gymnosperms which are considered to have their cones primitively unisexual and anemophilous, and to the right those which evolved on bisexual (anthostrobilate) lines and were primitively entomophilous.

DISCUSSION.

Dr. D. H. SCOTT congratulated Mr. Parkin on his paper, which in addition to its great scientific interest, was an act of loyalty to the memory of an old friend, whose loss we all lamented.

The speaker began by showing slides of the famous Hermosa Cycad (*Cycadeoidea Dartoni*), one of the finest fossil plants known. On the part of the stem preserved, no less than 500 ripe fruits were present, indicating that these plants may have fruited once for all and then died down, like some palms and bamboos at the present day.

Dr. Wieland had pointed out that the Bennettitean Cycads were "the stereotyped terminal forms of a side-branch from a great plastic and dominant precursor race." He added that the former were "exceptional to the point of abnormality."

Thus Wieland, to whom, more than any other individual, our present knowledge of the Bennettiteans was due, had himself warned us not to over-estimate their importance.

What then, was the "great plastic and dominant precursor race," which formed the main stock of Mesozoic Cycads? It was represented by the Williamsonian Tribe, a varied and extensive family, which included, broadly speaking, the more ancient members of the Cycadeoid class.

Lantern-slides were shown, illustrating the flowers and vegetative parts of *Williamsonia* itself, of Mr. Hamshaw Thomas's new genus *Williamsoniella*, and of Nathorst's *Wielandiella*. The latter genera, especially, departed widely from the Cycad type, as shown by their slender, much-branched stems and simpler leaves. If the origin of Angiosperms was to be sought among the ancient Cycadophytes, it was probably with the Williamsonian Tribe that the closer relation existed.

In these days one had learnt greater caution in speculations on phylogeny. Mr. Parkin had stated his case with becoming moderation and had shown that the derivation of the Flowering Plants from the great Cycadeoid plexus of the Mesozoic Age, was at least a tenable hypothesis.

Mr. H. HAMSHAW THOMAS (visitor) contended that all evolutionary theories must be concordant with Palæobotanical facts. Recent work shows that in the Middle Jurassic a group of plants existed as Angiosperms, though considerably different from those now existing. In some of the Jurassic Bennettitales are a few characters similar to those occurring in Angiosperms of to-day, but differing markedly in the structure of the gynoecium.

In the same bed as *Williamsoniella*, the speaker had unearthed female inflorescences and fruits of two genera which are undoubtedly Angiosperms, though their microsporangia or male flowers have not been found. These genera are *Gristhorpia* and *Caytonia* and were displayed in a series of lantern-slides: they probably bore leaves of the type long known as *Sagenopteris*,

formerly ranked amongst the Marsileaceæ on account of their shape and reticulate venation.

It is quite open to question whether these Caytoniales had any relationship to modern Angiosperms. They show that the Angiospermous type of gynoecium evolved at an early date, and that the plants which achieved this advance still had characters of a gymnospermous type, especially as regards their seeds.

Professor F. W. OLIVER inquired what was the author's view as to the closing of the carpels from the open state.

Dr. A. B. RENDLE contended that the paper consisted of two subjects which were unconnected with each other: the origin of Angiosperms and Bennettitales. He deprecated the designation of the theory as the Strobilus theory; that title would be equally applicable to other theories. He also protested against the attempt to derive the whole of the modern Angiosperms from the Ranalian plexus. The modern German system had done good service in indicating the affinities of certain orders of Dicotyledons, which had been separated from their allies by the French system, developed by Bentham and Hooker, on account of their apetalous character. But there were groups, such as the Amentifera, which might be regarded as descendants of older forms, contemporary with, or earlier than, the immediate ancestors of the Ranales. There were presumably many stages in the evolution of the modern Angiosperms, and it seemed more in accordance with facts to regard some of the modern apetalous groups as descendants from one or other of these.

Mr. PARKIN briefly replied to the observations contributed by the speakers.

The Geographical Distribution of some Transvaal Leguminosæ.

By J. BURTT-DAVY, F.L.S.

[Read 7th June, 1923.]

As far as available data enable us to show, the Leguminosæ form the largest family of Transvaal Spermatophyta, as regards numbers of species, having about 100 species more than the Compositæ, and comprising nearly 10 per cent. of the recorded species of the flora. The subfamily Papilionaceæ includes fifty-eight genera and 428 species; excluding the aliens, and the genus *Indigofera* which is not yet fully worked out, we have fifty genera and 325 species. Since the first Check-list of Transvaal Flowering Plants was published in 1911, the number of recorded species of Papilionaceæ has been nearly doubled. A large number of the genera have very few species, and there are few genera with many species, *i. e.*, forty-five species are distributed among thirty genera, while 188 occur in four genera. As a general rule, the genera with few species have no endemics: the greatest number of endemics occur in genera with the greatest number of species; but some of

the large genera have a small proportion of endemics, e.g., *Crotalaria*, with thirty-three species, and *Tephrosia*, with thirty-one, have only eight and nine endemics respectively.

The species show great variation in range, even in the same genus; some range almost the length of the Continent; others are restricted to very limited areas; every possible variation of range between these two extremes is covered by the majority of the species.

Classified according to their geographical range of distribution, the Papilionaceæ fall into five very distinct groups: (1) the South-western Cape Province Element, with only five species. When we take into further consideration the fact that eleven endemic South-western Cape genera of Papilionaceæ, with 270 species, do not occur at all in the Transvaal, it is clear that the connection between the floras of the Transvaal and the South-west Cape Province is negligible.

(2) The Kalahari Element. This comprises only nine species, confirming a much earlier-formed conclusion that the inclusion of the Transvaal in the "Kalahari Region" of the later volumes of the 'Flora Capensis' is quite misleading.

(3) The Rain-forest Element of the eastern high mountains, with only about five species.

These three elements together comprise not more than 6 per cent. of the total Papilionaceous flora. The remaining 94 per cent. (306 species) are divided between (4) the *Tropical African* Element, with 167 species (51 per cent. of the total), and (5) the *Warm Temperate Plateau* or the high-veld grass steppe flora of the eastern Transvaal and Orange Free State, and uplands of Natal, Griqualand East, Basutoland and the eastern portion of the Cape Province. This Warm Temperate Plateau Element comprises 139 species or 43 per cent. of the total.

Of these 306 species comprising the two predominant elements, 123 are endemic to the Transvaal. These endemics form 38 per cent. of the total; this proportion appears low when compared with the 72 per cent. endemics in New Zealand, or the 82 per cent. of the Hawaiian Islands. But if we add to the species which are strictly endemic within the political boundaries of the Transvaal, those species which range into the Border States but not beyond them, the number of endemics in the thus enlarged area is 78 per cent. of the population. In other words, if the Border States were to be submerged to-day, leaving the Transvaal as an island, we should have 78 per cent. of its Papilionaceæ as endemics, and 22 per cent. would be "wides" occurring also on the mainland.

Thus the only reason that we have such a small percentage of endemics in the Transvaal to-day is that some of them range across the political boundaries into Border States, while in the case of islands, the oceans have formed an insuperable barrier, either preventing the spread of species evolved since the isolation occurred, or destroying the individuals which had spread before the submergence of outlying territory.

The endemic genera of Africa are of two kinds: (*a*) those which are obviously "relicts" as Tansley terms them, e. g., *Encephalartos*, *Stangeria*, *Gnetum*, *Welwitschia*, *Adansonia*, *Sterculia*, etc., some of which are extremely local in their distribution, while others are wide spread: and (*b*) those which are in a state of flux, still developing new species and varieties, e. g., *Pearsonia*, *Pleiospora*, *Lotononis*, etc.

Fifteen species (less than 5 per cent.) are common to the Transvaal and India, and five species are found in Madagascar; the Malagasy Element may be found to be larger when the scattered literature has been collected into accessible form, and the scattered herbarium material has been more critically studied.

In connection with the view that, in some families at least, the arborescent forms are the older types, it is instructive to find that, with one exception, possibly introduced, the arborescent and shrubby species of Papilionaceæ (only about twenty in all) belong to the Tropical African Element, and that about half of them belong to genera with few species, four of the genera being monotypic. The Warm Temperate Plateau Element is made up, to an extraordinary degree, of species which have developed the suffrutescent habit, there being very few herbs and scarcely any annuals among them.

BENEFACCTIONS.

List in accordance with Bye-Laws, Chap. XVII. Sect. 1, of all Donations of the amount or value of Twenty pounds and upwards, received during the past Twenty years.

1904.

Royal Society : Grant in aid of third volume of the Chinese Flora, £120.

Frank Crisp, Esq. (afterwards Sir Frank Crisp, Bt.): Cost of Supplementary Royal Charter.

The same : Bulliard (J. B. F.). *Herbier de la France*; *Dictionnaire*; *Histoire des plantes vénéneuses*; *Champignons*, in 10 vols. Paris, 1750-1812.

1905.

Royal Society : First grant in aid of Dr. G. H. Fowler's 'Biscayan Plankton,' £50.

Executors of the late G. B. Buckton, Esq.: Contribution for colouring plates of his paper, £26.

1906.

Royal Society : Second grant towards 'Biscayan Plankton,' £50.

Subscription portrait of Prof. S. H. Vines, by Hon. John Collier.

Royal Swedish Academy of Science : Copies of portraits of C. von Linné, after Per Krafft the elder, and A. Roslin, both by Jean Haagen.

1907.

Royal University of Uppsala : Copy by Jean Haagen of portrait of C. v. Linné, by J. H. Scheffel (1739).

Royal Society : Third and final grant towards 'Biscayan Plankton,' £50.

The Trustees of the Percy Sladen Memorial Fund : First grant towards publication of Mr. Stanley Gardiner's *Researches in the Indian Ocean in H.M.S. 'Sealark'*, £200.

1908.

Prof. Gustaf Retzius : Plaster cast of bust of Carl von Linné, modelled by Walther Runeberg from the portrait by Scheffel (1739) at Linnés Hammarby : the bronze original designed for the façade of the new building for the Royal Academy of Science, Stockholm.

Miss Sarah Marianne Silver (afterwards Mrs. Sinclair), F.L.S. : Cabinet formerly belonging to Mr. S. W. Silver, F.L.S.

1909.

The Trustees of the Percy Sladen Memorial Fund: Second grant towards publication of Mr. Stanley Gardiner's *Researches in the Indian Ocean* in H.M.S. 'Sealark,' £200.

Prof. James William Helenus Trail, F.R.S., F.L.S.: Gift of £100 in Trust, to encourage Research on the Nature of Proto-plasm.

1910.

Royal Society: Grant towards Dr. G. H. Fowler's paper on *Biscayan Ostracoda*, £50.

Sir Joseph Hooker: Gold watch-chain worn by Robert Brown, and seal with portrait of Carl von Linné by Tassie.

Prof. J. S. Gardiner: Payment in aid of illustrations, £35 0s. 6d.

Sir Frank Crisp: Donation in Trust for Microscopical Research, £200.

The Trustees of the Percy Sladen Memorial Fund: Third grant towards publication of Prof. Stanley Gardiner's *Researches in the Indian Ocean*, £200. (For third volume.)

1911.

The Trustees of the Percy Sladen Memorial Fund: Second Donation towards the publication of the third volume on the *Indian Ocean Researches*, £70.

The same: First Donation towards the fourth volume, £130.

1912.

The Indian Government: Contribution towards the illustration of Mr. E. P. Stebbing's paper on *Himalayan Chermes*, £46 15s. 2d.

The late Mr. Francis Tagart, £500 free of Legacy Duty.

The late Sir Joseph Dalton Hooker, O.M., G.C.S.I., £100 free of Legacy Duty.

The Trustees of the Percy Sladen Memorial Fund: Second Donation towards the publication of the fourth volume on the *Indian Ocean Researches*, £140.

The same: First Donation towards the fifth volume, £60.

1913.

Royal Society: Grant towards Dr. R. R. Gates's paper on *Mutating Oenotheras*, £60.

Sir Frank Crisp, Bt.: *Wallichian Cabinets*, £50.

The Trustees of the Percy Sladen Memorial Fund: Second Donation towards the publication of the fifth volume, £200.

1914.

- Royal Society : Grant towards Miss Gibbs's paper on the Flora of British North Borneo, £50.
 Miss Foot : Cost of illustration of her paper on *Euschistus*.
 The Trustees of the Percy Sladen Memorial Fund : Third Donation towards the fifth volume, £10.
 The same : First Donation towards the sixth volume, £190.

1915.

- The Trustees of the Percy Sladen Memorial Fund : Second Donation towards the sixth volume, £80.
 Miss Foot : Cost of second paper on *Euschistus*, £32 10s.
 Royal Society : Donations towards the cost of a paper by Mrs. Arber, D.Sc., £40.
 The same : towards paper on Utakwa River plants by Mr. H. N. Ridley, C.M.G., F.R.S., £50.
 Miss Marietta Pallis : Instalment of cost of her paper on *Plav*, £30.
 Thomas Henry Riches, Esq. : Dr. A. R. Wallace's library on Natural History.
 Sir Frank Crisp, Bt. : New shelving for Wallace's Volumes.

1916.

- Mr. E. Heron-Allen : Contribution to cost of paper on Foraminifera of N.W. Scotland, £44.
 Messrs. H. Takeda and C. West : Contribution towards the illustration of their paper, £40.
 Royal Society : Contribution towards the illustration of two papers by Prof. Dendy, £40.
 The same : Contribution towards Mr. Swynnerton's paper on Form and Colouring, £70.
 The High Commission for the Union of South Africa, per Dr. J. D. F. Gilchrist, for the illustration of his paper on *Jasus Lalandii*, £30.
 Miss Marietta Pallis : Balance of cost of her paper on *Plav*, £90 16s. 6d.
 Sir Frank Crisp, Bt. : Phototyped copy of Dioscorides from the 'Codex Aniciæ Julianæ' at Vienna.

1917.

- British Ornithologists' Union, etc. : Contribution towards cost of Mr. H. N. Ridley's paper, £20.
 The Royal Society : Second contribution towards the printing of Mr. C. F. M. Swynnerton's paper on Form and Colouring, £75.
 Sir Frank Crisp, Bt. : 'Lindenia,' Ghent, 1891-1901. 17 vols. sm. fol.

1919.

- Dr. B. Daydon Jackson: MS. index to Linnean Society's Journal, Botany, vols. xxi.-xl. (1884-1912) and the Botanic entries in the 'Proceedings' for the same period.

1920.

- The Royal Society: Third contribution towards the printing of Mr. C. F. M. Swynnerton's paper as above, £50.
 The High Commission for the Union of South Africa, for the printing of Dr. J. D. F. Gilchrist's paper on *Jasus Lalandii*, Part II., £60.

1921.

- The Percy Sladen Memorial Fund: Additional Grant in aid of publication of 'Transactions,' 2nd ser., Zoology, vol. xvii. part 4, £72 10s.
 The same: Grant in aid of publication of four papers on the Houtman Abrolhos Islands, £100.
 The Royal Society: Donation in aid of papers by Mr. N. E. Brown and Mr. S. L. Moore, £90.
 Dr. W. Rushton Parker: Donation of a large series of portraits of Naturalists and Persons after whom Genera have been named, and work on rearrangement and annotation of the entire collection.
 Prof. C. S. Sargent, F.M.L.S.: Eight volumes issued by the Arnold Arboretum, including "The Bradley Bibliography."

1922.

- The late Sir Joseph Hooker: Donation of his Medals and Decorations. (Reversion to Linnean Society on Lady Hooker's decease.)
 Anonymous donation in aid of publication of the late Dr. E. A. Newell Arber's paper, entitled "Critical Studies of Coal-Measure Plant-impressions," £60.

1923.

- Dr. W. Rushton Parker: (1) Donation of Oxford New English Dictionary; vols. i.-ix., vol. x. in parts, 4to, 1888-1923
 (2) Encyclopædia Britannica; ed. XI. Cambridge, 1920-22. 32 vols. 4to.

ADDITIONS AND DONATIONS

TO THE

LIBRARY.

1922-1923.

Algiers. Société d'Histoire Naturelle de l'Afrique du Nord.
Bulletin. 1→ 8vo. *Alger*, 1910→

Arber (E. A. Newell). Devonian Floras. A Study of the Origin
of Cormophyta.

8vo. *Cambridge*, 1921. Dr. A. Smith Woodward.

Babington (Charles Cardale). Manual of British Botany. Con-
taining the Flowering Plants and Ferns arranged according to
the Natural Orders. Ed. 10. Edited by A. J. WILMOTT.

8vo. *London*, 1922.

Bailey (L. H.). The Standard Cyclopedia of Horticulture. 6 vols.
4to. *New York*, 1919.

Baker (E. C. Stuart). See **Blanford (W. T.).** The Fauna of
British India—Birds. Vol. I.

Bevan (E. J.). See **Cross (C. F.).**

Black (J. M.). Flora of South Australia. Part I. Cyatheaceæ-
Orchidaceæ. 8vo. *Adelaide*, 1922.

— The Naturalized Flora of South Australia.

8vo. *Adelaide*, 1909.

Blanford (W. T.). The Fauna of British India, including Ceylon
and Burma. Birds. Vol. I. (Ed. 2). By E. C. STUART BAKER.

8vo. *London*, 1922.

Botanisches Archiv. Zeitschrift für die gesammte Botanik.
Herausgegeben von Dr. CARL MEZ. Bd. I.→

4to. *Königsberg*, 1922→

Bower (F. O.). The Ferns (Filicales). Vol. I. (Cambridge
Botanical Handbooks.) 4to. *Cambridge*, 1923.

British Museum (Natural History).

Catalogue of the Books, Manuscripts, Maps, and Drawings in
the British Museum (Natural History). Vol. VI., Supple-
ment A-I. 4to. *London*, 1922.

MAMMALS.

Catalogue of the Selous Collection of Big Game in the British
Museum (Natural History). 8vo. *London*, 1921.

REPTILES.

Monograph of the Lacertidæ. By GEORGE ALBERT BOULENGER.
Vol. II. 8vo. *London*, 1921.

British Museum (cont.):—**FOSSILS.**

- Catalogue of the Fossil Bryozoa (Polyzoa) in the Department of Geology, British Museum (Natural History). The Cretaceous Bryozoa (Polyzoa). Vol. IV. The Cribrimorphs. Part II. By W. D. LANG. 8vo. London, 1922.
- Bromfield (William Arnold). *Flora Vectensis*. 2 vols. (Annotations by A. G. MORE). 8vo. London, 1856. H. J. Jeffery.
- Supplement. See MORE (A. G.).
- Brunet (Jacques Charles). *Manuel du Libraire*, etc. 5 vols. 8vo. Paris, 1842–1844. Dr. W. Rushton Parker.
- Buller (A. H. Reginald). *Researches on Fungi*. Vol. II. 8vo. London, 1922.
- Butler (Edward A.). *A Biology of the British Hemiptera—Heteroptera*. 4to. London, 1923.
- Camus (A.). *Les Cyprés. Genre Cupressus*. 4to. Paris, 1914.
- Carpenter (George H.). *Insect Transformation*. 8vo. London [1921].
- Chipp (T. F.). *The Forest Officers' Handbook of the Gold Coast, Ashanti, and the Northern Territories*. 8vo. London [1922]. Author.
- Clarke (J. Jackson). *Protists and Disease*. 8vo. London, 1922. Author.
- Cockayne (L.). See Engler (A.) and Drude (O.). *Die Vegetation der Erde*. XIV.
- Cross (C. F.) and Bevan (E. J.). *Cellulose*. 8vo. London, 1895. Dr. W. Rushton Parker.
- Cumming (Linnæus). *List of the Plants found in the country around Rugby*. 8vo. Rugby, 1923.
- Davey (F. Hamilton). *Flora of Cornwall. A Supplement by EDGAR THURSTON and CHAMBRÉ C. VIGERS*. (Royal Inst. Cornwall Journ. xxi.) 8vo. Truro, 1922.
- Dennistoun (James). *Memoirs of the Dukes of Urbino*. 3 vols. 8vo. London, 1851. Dr. W. Rushton Parker.
- Engler (Adolf) and Drude (Oscar). *Die Vegetation der Erde*. 8vo. Leipzig, 1896–1923.
- XIV. *The Vegetation of New Zealand*. By L. COCKAYNE. 1921.
- XV. *Die Pflanzenwelt der bolivischen Anden und ihres östlichen Vorlandes von Prof. Dr. TH. HERZOG*. 1923.
- Gardner (George). *Musci Britannici or Pocket Herbarium of British Mosses*. 8vo. Glasgow, 1836. Miss May Rathbone.
- Guérin-Méneville (F. E.). *Iconographie du Règne Animal de G. Cuvier*, etc. 3 vols. 8vo. Paris & Londres, 1829–44. Hugh Findon.
- Gunther (R. T.). *Early British Botanists and their Gardens*. Based on unpublished writings of Goodyer, Tradescant, and others. 8vo. Oxford, 1922.
- Hall (Sir Alfred David). *The Soil*. 8vo. London, 1903. Dr. W. Rushton Parker.
- Herzog (Th.). See Engler (A.) and Drude (O.). *Die Vegetation der Erde*. XV.

- [Hill (John).] Eden: or a compleat body of gardening, . . . from the papers of the late Mr. Hale. Folio. London, 1757.
- Hirmer (Max). Zur Lösung des Problems der Blattstellungen. 8vo. Jena, 1922.
- Howard (H. Eliot). Territory in Bird Life. 8vo. London, 1920.
- Howarth (O. J. R.). The British Association for the Advancement of Science. A Retrospect. 1831-1921. 8vo. London, 1922.
- Hutchinson (Rev. H. M.). Extinct Monsters. 8vo. London, 1897. Dr. W. Rushton Parker.
- Johansson (K.) and Samuelsson (G.). Dalarnes *Hieracia* Vulgatiformia. 8vo. Leipzig, 1923. Authors.
- Journal of Indian Botany. Edited by P. F. Fyson. Vol. I. 8vo. Madras, 1919.
- Kanehara (Ryozô). Anatomical Characters and Identification of Formosan Woods.—Identification of the important Japanese Woods by Anatomical Characters. (Supplement.) 4to. Taihoku, 1921.
- Knoche (Herman). Flora Balearica. Etude Phytogéographique sur les Iles Baléares. I. 8vo. [Montpellier] 1921. Author.
- Komai (Taku). Studies on Two Aberrant Ctenophorea, *Cœloplana* and *Gastrodes*. 4to. Kyoto, 1922. Author.
- Le Maout (Emm.) et Decaisne (Jos.). Traité général de Botanique. Descriptive et Analytique. Ed. 2. 4to. Paris, 1876. L. L. Belinfante.
- Liddle (Henry George) and Scott (Robert). A Greek-English Lexicon. Ed. 7. 4to. Oxford, 1883. Dr. W. Rushton Parker.
- Lubbock (Sir John, afterwards First Baron Avebury). The Origin of Civilisation and the Primitive Condition of Man. 8vo. London, 1889. Dr. W. Rushton Parker.
- Pre-historic Times as illustrated by Ancient Remains and the Manners and Customs of Modern Savages. 8vo. London, 1900. Dr. W. Rushton Parker.
- Lyell (Sir Charles). Principles of Geology. 8vo. London, 1850. Dr. W. Rushton Parker.
- The Geological Evidences of the Antiquity of Man. 8vo. London, 1863. Dr. W. Rushton Parker.
- Macbride (Thomas H.). The North American Slime-moulds. 8vo. New York, 1922. Miss G. Lister.
- McNicol (David H.). Dictionary of Natural History Terms. 8vo. London, 1863. Dr. W. Rushton Parker.
- More (A. G.). A Supplement to the 'Flora Vectensis.' 8vo. London, 1871. H. J. Jeffery.
- Munro (Robert). Rambles and Studies in Bosnia-Herzegovina and Dalmatia. 8vo. Edinburgh & London, 1895. Dr. W. Rushton Parker.
- Murray (Sir John) and Hjort (Dr. Johan). The Depths of the Ocean. 8vo. London, 1912.
- Oltmanns (Friedrich). Das Pflanzenleben des Schwarzwaldes. 2 vols. 8vo. [Freiburg i/Br.], 1922.

- Osborn (Henry Fairfield).** Men of the Old Stone Age: their environment, life, and art.
8vo. *London*, 1916. **Dr. W. Rushton Parker.**
- Palmer (T. S.).** Index Generum Mammalium. (U.S. Dept. Agric., N. Amer. Fauna, No. 23.) 8vo. *Washington*, 1904.
- Pearce (Ethel Katherine).** Typical Flies. A Photographic Atlas of Diptera, including Aphaniptera. 2 vols.
4to. *Cambridge*, 1915-21. **Author.**
- Pritchard (Andrew).** A History of Infusoria: Living and Fossil.
8vo. *London*, 1845. **Dr. W. Rushton Parker.**
- Rangachari (K.).** A Manual of Elementary Botany for India. Second Edition. 8vo. *Madras*, 1921. **Author.**
- Ridley (Henry Nicholas).** The Flora of the Malay Peninsula. With illustrations by J. HUTCHINSON.
Vol. I. Polypetalæ.
Vol. II. Gamopetalæ.
8vo. *London*, 1922-3. **Government of the Straits Settlements.**
- Roger (Alex.).** A Handbook of the Forest Products of Burma.
8vo. *Rangoon*, 1921. **Author.**
- Rohde (Eleanour Sinclair).** The Old English Herbals.
8vo. *London*, 1922.
- Samuelsson (G.).** See **Johansson (K.).**
- Sargent (Charles Sprague).** The Silva of North America. 14 vols., *illustr.*
Folio. *Boston & New York*, 1890-1902. **Tagart Fund.**
- Manual of the Trees of North America (exclusive of Mexico). Ed. 2. 8vo. *London* [1921].
- Schlich (Sir Wm.).** Manual of Forestry. Ed. 4. Vol. I. Forest Policy in the British Empire. 8vo. *London*, 1922. **Author.**
- Sedgwick (Adam).** A Discourse on the Studies of the University of Cambridge. Ed. 5. 8vo. *London*, 1850. **H. W. Monckton.**
- Sherborn (Charles Davies).** Index Animalium sive index nominum quæ ab A.D. 1758 generibus et speciebus animalium imposita sunt Sectio secunda usque ad finem 1850. Pars I.
8vo. *London*, 1922.
- Spitta (Edmund J.).** Microscopy.
8vo. *London*, 1907. **Dr. W. Rushton Parker.**
- Stager (Walter).** Tall Bearded Iris (*Fleur-de-Lis*). A Flower of Song. 8vo. *Sterling, Ill.*, 1922. **Author.**
- Stone (Herbert) and Cox (H. A.).** A Guide to the Identification of the more useful Timbers of Nigeria. 8vo. *London* [1922].
- Struthers (John).** Memoir on the Anatomy of the Humpback Whale (*Megaptera longimana*).
8vo. *Edinburgh*, 1889. **Dr. W. Rushton Parker.**
- Swann (H. Kirke).** A Synoptical List of the Accipitres.
8vo. *London*, 1919-20. **Author.**
- A Synopsis of the Accipitres. Ed. 2.
8vo. *London*, 1921-22.
- Thomson (George Malcolm).** The Naturalization of Animals and Plants in New Zealand. 8vo. *Cambridge*, 1922.

Thurston (Edgar). *See* Davey (F. Hamilton).

Turner (Fred). Australian Grasses and Pasture Plants.
8vo. Melbourne [1921]. Author.

Vigurs (Chambré C.). *See* Davey (F. Hamilton).

Walsh (Lt.-Col. J. H. Tull). Plague: Recent progress in Etiology,
Pathology, and Treatment. (Trop. Diseases Bull. xix.)

8vo. London, 1922. Author.

Wilmott (Alfred James). *See* Babington (C. C.). Manual of
British Botany. Ed. 10.

Wilson (Wm. F.). With Lord Byron at the Sandwich Islands in
1825. Being extracts from the MS. Diary of James Macrae,
Scottish Botanist.

8vo. Honolulu, 1922. Author.

Zahlbruckner (Alexander). Catalogus lichenum universalis.
Band I.→

8vo. Leipzig, 1921→

INDEX TO THE PROCEEDINGS.

SESSION 1922-1923.

Note.—The following are not indexed :—The name of the Chairman at each meeting ; speakers whose remarks are not reported ; and passing allusions.

- Abnormal leaves of Ash (Sprague), 4.
 Abraham, H. C., el. 17; prop. 14; second reading, 15.
 Abrolhos Isl., Opisthobranchia from (O'Donoghue), 50.
 — Sponges from (Dendy & Frederick), 49.
 Abstracts, 51-68.
 Acari, notes on (Halbert), 13.
 Accessions to Library, 73-77.
 Accounts, 24-26.
 Acquired characters (Kammerer), 19.
 Address, Presidential, 27-34.
 African woodlands, 13.
 Agardh, C. A., 'Aphorismi' (Jackson), 12.
 Alcock, Miss N. L., prop. 21; el. 48.
 Algæ from Lahore (Ghose), 18.
 Allen, Sir James, Linnean Medal received for T. F. Cheeseman, 26, 35.
 Allwood, M. O., el. 6; prop. 3; second time, 5.
 Alterations in Bye-laws proposed, 2; passed, 5; read second time, 3.
 Altson, A. M., *Lyctus brunneus*, egg, 11; its genitals, 18.
 America, South, butterflies, new discovery of mimicry, 6.
 Anatomy of seedling *Ricinus* (Thomas), 49.
 Anatomy of wallflowers (Scott), 50.
 Angiospermous Descent (Parkin), 14.
 Annual Report of Treasurer, 21, 24-26.
 'Aphorismi botanici' (Jackson), 12.
Apium australe, Thou., mentioned, 8.
 — sp. nov., on Gough Island, 8.
 Arunachalam, S., el. 13; prop. 9; second reading, 11.
 Ash, twin-leaves of (Sprague), 4.
 Associates deceased, 22; two vacancies, 2.
 Auditors elected, 17.
 Australia, West, Echinoderms from, 10.
Bacillus tuberculosis, 18.
 Baker, E. G., colouring of Curtis's Fl. Londonensis, 17; plants on Gough Island, 8.
 Balfour, Prof. I. B., death, 22; obituary, 36.
 Bandulska, Miss H., Cuticular structures from Middle Eocene at Bourne-mouth, 8.
 — adm. 7; el. 6; prop. 1; second reading, 3.
 Banks, Sir J., visitors' books recording weight, 5.
 Barber, C., withdr., 22.
 Barclay, W., death, 22; el. 17; prop. as Associate, 13; second reading, 14; thanks, 19.
 Barr, R., adm. 47; el. 17; prop. 14; second reading, 15.
 Bateson, Dr. W., el. Councillor, 23; on acquired characters, 21.
 Batten, Dr. Lily, *Polysiphonia*, 7.
 Baubin's orchids, 4.
 Bawtree, A. W., death, 22.
 Bear Island lichens, 11.
 Benefactions, 1903-1923, 69-72.
 Berry-Lewis, F., adm., 7.
 Bidder, Dr. G. P., el. Councillor, 23.
 Birds' courtship (Huxley), 2.
 Blackwell, Miss E. M., adm. 11; el. 6; prop. 1; second reading, 3.
 Blagden, Sir C., and Sir J. Banks, 5.
 Bonhote, J. L. J., death, 22.
 Bonnier, Prof. G. E. M., For. Memb., death, 8, 22; obituary, 37.
 Botanic illustration in colour (Jackson), 15; postponed, 13.

- Bournemouth Middle Eocene, cuticular structures from (Bandulska), 8.
- Briquet, Dr. J. L., el. as For. Memb., 17; prop. 13; second reading, 14; thanks, 19.
- Britain, *Calamintha batica* in (Pugsley), 7; *Festuca rubra* in (Howarth), 7.
- British mosses, shown (Sherrin), 9; species of *Polysiphonia* (Batten), 7.
- Britten, J., on Dryander's work, 46.
- Brooks, F. T., adm. 7; el. 6; prop. 3; second time, 5.
- Brown, R., microscopes shown, 9.
- Browne, E. T., el. Auditor, 17.
- Bruce, Rev. F. R. C., adm. 21; el. 17; prop. 13; second reading, 14.
- Buffon's 'Histoire Naturelle,' pres., 1.
- Bullock-Webster, Canon G. R., *Chara hispida* varieties shown, 12; vote of thanks, 34.
- Bunny, J., adm. 7; el. 6; prop. 1; second reading, 3.
- Bunyard, G. N., adm. 7; el. 6; prop. 3; second time, 5.
- Burne, R. H., el. Councillor, 23.
- Burt-Davy, J., Transvaal Leguminosæ, 47; 66-68.
- Butterflies, mimicry in S. America, 6.
- Bye-Laws, accepted, 5; alterations read, 2; second time, 3.
- Calamintha ascendens*, Jord., 7.
- *batica*, Boiss. in Britain (Pugsley), 7.
- *Nepeta*, Savi, 7.
- *sylvatica*, Bromf., 7.
- Cahman, Dr. W. T., comm. (Halbert), 13; el. Auditor, 17; el. Councillor and Sec., 23.
- Campbell, Rev. A. J., withdr. 22.
- Cape Orchids, velaminous roots, 47.
- Carruthers, Dr. W., death, 22; obituary, 38.
- Caytonia* shown, 65.
- Cellularine Polyzoa (Harmer), 9.
- Chaetoceros* (Turner), 11; (Yermoloff), 10.
- *diadema*, Gran, 10.
- Chapman, R. E., adm., 14; el. 6; prop. 1; second reading, 3.
- Chara hispida* varieties (Bullock-Webster), 12.
- Characters acquired (Kammerer), 19.
- Charophyta, Indian (Groves), 18.
- Cheeseman, T. F., Linnean Medal awarded, 35.
- Cheiranthus Cheiri*, its early anatomy (Scott), 50.
- Chenopodium* as food (Wilkins), 8.
- Chlorops tenuipus*, Meig. (Frew), 18.
- Chrysanthemum* from Banksian herbarium, 2.
- *Leucanthemum*, Oxeye Daisy, fasciated, 50.
- Chubb, C., adm. as Assoc. 15; el. 7 prop. 5.
- Clark, H. L., Echinoderms from W. Australia, 10.
- Clarke, Sir E., death, 22.
- Cleare, L. D., jun., prop. 46; second reading, 47.
- Cœlenterates (Ferrer), 14.
- Cole, W., death, 22; obituary, 41.
- Colias edusa* oviposition (Lancum), 11.
- Colour in illustration (Jackson), 15.
- Cory, R., adm. 1.
- Cotula goughensis*, Rud. Br., 8.
- Council elected, 23.
- Courtship of birds (Huxley), 2.
- Crepis*, fasciated, 50.
- Crustacean plankton of English Lakes (Gurney), 18.
- Cunningham, J. T., on acquired characters, 21.
- Cuticular structures from Middle Eocene at Bournemouth (Bandulska), 8.
- Cutler, D. W., comm. (Sandon), 46.
- Daffodil, three-flowered (Rendle), 15.
- Dahlia* from Banksian herbarium, 2.
- Dakin, Prof. W. J., comm. (O'Donoghue), 50.
- Deaths reported, 22.
- Dendy, Prof. A., Sponges from Abrolhos Islands, 49.
- Descent of Angiosperms (Parkin), 14.
- Desmids from Wales (Turner), 11.
- De Winton, W. E., death, 22.
- Diatoms (Yermoloff), 10.
- Didcladia*, Ehrenb., 10.
- Dictionary, New Oxford, presented, 1.
- Didymocarpus* in Malaya, 47.
- Digitalis purpurea*, Foxglove, fasciated, 50.
- Dixon, Miss A., adm. 14; el. 6; prop. 1; second reading, 3.
- Dixon, E., three-flowered daffodil, 15.
- Dolomites, plants from, 13.
- Donations, 1903-1923, 69-72.
- Dryander, J., entries in Banks's visitors' book, 5; his work, 46.
- Dymes, T. A., seeds of Marsh Orchids, 41.
- Earland, A., see Heron-Allen, E., 48; New genera of Foraminifera, 48; paper postponed, 15.

- Echinoderms from W. Australia (Clark), 10.
 Edwards, S., el. Auditor, 17.
 Edwards, W. N., Orchids from Öland, 3.
 Egan, T. F., el. 48; prop. 17; second reading, 19.
 Egg of *Lyctus brunneus* (Altson), 11.
 Elephant Island, plants on, 8.
 Elwes, H. J., death, 22; obituary, 41.
Empetrum on Gough Island, 8.
 — *nigrum*, L., var. *rubrum*, Hemsl., 8.
 'Encyclopædia Britannica' presented, 1.
 Endemics (Ridley), 47.
Eulophia, velaminous roots (Moss), 47.
 Exmouth, *Ranunculus Ficaria* with peculiar flowers, 14.
 Fasciated plants (Rendle), 50.
 Fasciation of Daffodil (Rendle), 15.
 Fawcett, W., el. 48; prop. 17; second reading, 19.
 Fellows deceased, 22; withdr. 22.
 Fenton, E. W., adm. 14; el. 13; prop. 9; second reading, 11.
 Fern-House at Kew (Hill), 9.
 Ferrer, Dr. F., Coelenterates and sponges, 14.
Festuca rubra in Britain (Howarth), 17.
 Findon, H., colour-printing from wood-blocks, 15.
 Foraminifera of Lord Howe Island (Heron-Allen & Earland), 48.
 Foreign Member deceased, 22.
 Forests, African, 13.
Forstera, G. Forster on, 2.
Forstera or *Forstera* in hb. Linn., 2.
 Foxglove, fasciated, 50.
Fraxinus excelsior, twin-leaves of (Sprague), 4.
 Frederick, Miss L. M., sponges from Abrolhos Islands, 49.
 Frew, J. G. H., *Chlorops taniopus*, 18.
 Fritch, Prof. F. E., comm. (Ghose), 18; el. Councillor, 23.
 Frost, G. A., adm. 7; el. 6; otoliths shown, 14; prop. 1; second reading, 3.
 Fruit of *Hippuris* (Rendle), 15.
 Gardiner, W., 'Musci Britannici' shown, 10.
 Ghose, S. L., Algæ from Lahore, 18.
 Gilchrist, Dr. J. D. F., *Ptychodera*, 46.
 Gill, E. L., see Watson, D. S. M.
Gnaphalium pyramidale, Thou., 8.
 Godfery, Col. M. J., on orchids, 49.
 Goodall, T. B., death, 22.
 Gooding, Dr. R., death, 20.
 Goodrich, Prof. E. S., app. V.-Pres., 46; comm. (Huxley), 2, (Watson & Gill), 5; el. Councillor, 23; on acquired characters, 21.
Goniothecium, Ehrenb., 10.
 Gordon, Prof. W. T., on *Pitys*, 18.
 Gough Island, plants found, 8.
 Grape on a vine-tendrill, 2.
 Greenwood, W. F. N., el. 6.
Gristhorpia shown, 65.
 Groves, J., Indian Charophyta, 18.
 Gullane, *Pitys* from (Gordon), 1.
 Gupta, B. L., el. 48; prop. 19; second reading, 46.
 Gurney, J. H., death, 22; obituary, 43.
 Gurney, R., adm. 3; Crustacean plankton of English Lakes, 18.
 Güssow, H. T., prop. 46; second reading, 47.
 Gwynne-Vaughan, Prof. Dame Helen, comm. (Batten), 7; el. Councillor, 23.
 Halbert, J. N., notes on Acari, 13.
 Hands, née Samuel, Mrs. M., withdr., 22.
 Harmer, Sir S. F., Cellularine Polyzoa, 8; el. Councillor, 23.
 Harding, H. B., adm. 1.
 Hartog, Dr. M. M., withdr. 22.
 'Hepaticæ Britannicæ' shown, 9.
Hercotheca, Ehrenb., 10.
 Heron-Allen, E., & A. Earland, Foraminifera of Lord Howe Island, 48; paper postponed, 15.
 Hill, Dr. A. W., app. V.-Pres. 46; el. Councillor, 23; Tropical Fern-house at Kew, 9.
Hippuris vulgaris, fruit (Rendle), 15.
 Hogg, S., withdr. 22.
 Hollows, W. E., *Ranunculus Ficaria* with bleached flowers, 14.
 Howard, W. O., adm. 6; *Festuca rubra* in Britain, 7.
 Hunter, Major C., adm. 13; el. 6.
 Huxley, J. S., Courtship of birds, 2.
Hydrocotyle leucocephala, Cham. & Schlecht., 8.
 Illustration in colour (Jackson), 15; previously postponed, 13.
 Imms, Dr. A. D., comm. (Altson), 11, 18; — (Frew), 18.
 Indian Charophyta (Groves), 18.

- Iris Kämpferi*, by coloured wood-blocks (Jackson), 16.
- Jackson, B. Daydon, Agardh's 'Aphorismi,' 12; botanic illustration in colour, 15; — postponed, 13; el. Councillor and Sec., 23; *Forsteria*, 2; Giant trees of Victoria, 6; on Banks's visitors' book, 5.
- Jackson, Sir F. J., withdr. 22.
- Johnson, Dr. S., & Sir C. Blagden, 5.
- Kalahari region, 47.
- Kammerer, Prof. P., acquired characters, 19.
- Kerr, Dr. A. F. G., prop. 47.
- Kew, Fern House at (Hill), 9.
- Knight, Miss M., el. 48; prop. 17; second reading, 19.
- Lahore, algæ from (Ghose), 18.
- Lakes, crustacean plankton (Gurney), 18.
- Lancum, F. H., oviposition by *Colias edusa*, 11.
- Leaves, abnormal, of Ash (Sprague), 4.
- Leguminosæ in Transvaal (Burit-Davy), 47; — abstr. 66-68.
- Lely, H. V., adm. 1.
- Lester-Garland, L. V., el. Auditor, 17; — Councillor, 23.
- Lewton-Brain, L., death, 22.
- Librarian's Report, 22.
- Library Accessions, 73.
- Lichens from Spitzbergen (Paulson), 11.
- Linné, C. v., *Orchis latifolia* in Öland, 3.
- Linné, C. v., *fil.*, at Banks's house, 5; on *Forsteria*, 2.
- Linnean hb., *Forsteria* in, 2.
- Linnean Medal presented, 35.
- Loder, G. W. E., on *Eucalyptus* trees, 6.
- Lomaria Boryana*, Willd., 8.
- Lord Howe Island Foraminifera (Heron-Allen & Earland), 41.
- Lyctus brunneus*, egg (Altson), 11; its genitals (Altson), 18.
- MacIvor's 'Hepaticæ Britannicæ,' 9.
- McGillivray, adm. 15; el. 6; prop. 3; second reading, 5.
- McWalter, Dr. J. C., death, 22.
- Malaya, *Didymocarpus* in, 47.
- Marquand, C. V. B., adm. 15.
- Mason, F., spirit specimens, 46.
- Maude, A. H., plants from Dolomites shown, 13; seconded vote of thanks, 34.
- Meade-Waldo, E. G. B., withdr. 22.
- Mesembryanthemum*, spirit specimens, 46.
- Microscopes shown which belonged to R. Brown, 9.
- Mimicry in S. American butterflies, 6.
- Miranda, Francis, prop. 11; second reading, 13.
- Mitchell-Hedges, F. A., adm. 15.
- Mitra, M., prop. 46; second reading, 47.
- Monckton, H. W., app. V.-Pres., 46; el. Councillor and Treasurer, 23.
- Monington, H. W., withdr. 22.
- Monro, C. C. A., el. 48; prop. 17; second reading, 19.
- Moss-books shown (Sherrin), 9.
- Moss, Prof. C. E., Kalahari region, 47; on *Quercus* roots, 18; *Salicornia*, 46; velaminous roots of orchids, 47.
- Mukerjee, Prof. N. M., el. 48; prop. 19; second reading, 46.
- 'Musci Britannici,' shown, 10.
- Naples plankton, *Chatoceros* from, 11.
- Nevill, Bp. S. T. D., death, 22; obituary, 44.
- Norman, J. R., el. 13; prop. 6; second reading, 7.
- Nowell, W., el. 6.
- O'Donoghue, Dr. C. H., Opisthobranchia from Abrolhos Islands, 50.
- Officers elected, 23.
- Öland, *Orchis latifolia* from original station, 3.
- Oliver, F. W., on Parkin's paper, 66.
- Opisthobranchia from Abrolhos Islands (O'Donoghue), 50.
- Orchid, Col. M. J. Godfery on, 49.
- Orchids, velaminous roots, 47.
- Orchis ericetorum*, Lint., 48.
- *Fuchsii*, Druce, 48.
- *incarnata*, Linn., 3, 48.
- *latifolia*, Linn., 49.
- *maculata*, Linn., 4; seeds, 48.
- *majalis*, Reichb., 4; seeds, 49.
- *O'Kellyi*, Druce, 48.
- *præcoa*, Webst., 48.
- *prætermissa*, Druce, 3, 4, 48.
- *purpurella*, Steph., pat. and fil., 48.
- *sambucina*, Linn., 3.
- Ox-eye Daisy, fasciated, 50.
- Oxford Dictionary presented, 1.
- Palæozoic Dipnoid fishes (Watson & Gill), 6.
- Pantling, R., his method of colouring plates (Prain), 16.
- Parker, Dr. W. R., thanks for gifts, 1.

- Parkin, J., *Ranunculus acris* with aborted stamens, 50; Strobilus theory of Angiospermous Descent, 14; — abstr., 51-64.
- Paulson, R., lichens from Spitzbergen, 11.
- Pearce, Miss E. K., adm. 15; el. 13; prop. 9; second reading, 11.
- Pearson, W. H., Associate deceased, 19, 22; obituary, 45.
- Peirce, J. D., Giant trees of Victoria, 6.
- Phlyca arborea* on Gough Island, 8.
- Picharn, P. V., withdr. 22.
- Pistacia Lentiscus*, abnormal leaves, 5.
- Pitys* (Gordon), 18.
- Plankton, crustacean (Gurney), 18.
- Naples, Diatoms from, 11.
- Pole-Evans, *née* Thomson, Mrs. M. R. H., withdr. 22.
- Polysiphonia*, British (Batten), 7.
- Polyzoa (Harmer), 9.
- Poulton, Prof. E. B., Mimicry in South American butterflies, 6.
- Præses as author (Jackson), 12.
- Prain, Sir D., R. Pantling's method of colouring plates, 16.
- Presidential Address, 27-34.
- Prince Charles Foreland lichens, 11.
- Procter, Miss J. B., el. 48; prop. 17; second reading, 19.
- Ptychodera cupensis* (Gilchrist), 46.
- Pugsley, H. W., *Calamintha batica* in Britain, 7.
- Pycraft, W. P., adm. 19; el. 17; prop. 14; second reading, 14.
- Quercus pedunculata* and *Q. sessiliflora*, length of roots (Moss), 18.
- *Quest' collections (Wilkins), 8.
- Ramsbottom, J., el. Councillor and Sec., 23.
- Ranunculus acris*, abnormal, 50.
- *Picaria* with bleached flowers, 14.
- Rathbone, Miss, 'Musci Britannici', 10.
- Reeves, J., withdr. 22.
- Rendle, Dr. A. B., Banks's Visitors' book, 5; Brown's pocket microscope, 9; comm. (Wilkins) 8; colouring of editions of herbals, 17; *Dahlia* and *Chrysanthemum* from Banksian herbarium, 2; el. Councillor and President, 23; fasciated *Crepis*, Ox-eye Daisy, and Foxgloves, 50; fruit of *Hippuris*, 51; on Parkin's paper, 66; seedling oak with long tap-root, 17; three-flowered Daffodil, 15; vine-tendrils bearing grape, 2.
- Report of Librarian, 22.
- of Treasurer, 21, 24-26.
- Respondentes, custom in Scandinavia (Jackson), 12.
- Richmond-Brown, L. A. M., Lady, el. 48; prop. 19; second reading, 46.
- Ricinus*, seedling anatomy (Thomas), 19.
- Ridley, H. N., Endemics, 47.
- Rothschild, Lord, el. Councillor, 23.
- Root of seedling oak (Rerdle), 17.
- Rowett, J. R., plants collected by, 8.
- Rumex frutescens*, Thou., 8.
- Salamandra*, acquired characters (Kammerer), 6.
- Salicornia* in S. Africa (Moss), 48.
- Salisbury, Dr. E. J., el. Councillor, 23.
- St. John-Brooks, R. T., prop. 47.
- Salmon, C. E., colouring in herbals, 16.
- Samuel, afterw. Mrs. Hands, withdr. 22.
- Sandon, H., Protozoa from Spitzbergen, 46.
- Scott, Dr. D. H., comm. (Gordon), 18; early anatomy of Wallflowers, 50; on Parkin's paper, 65.
- Sedgwick, L. J., question of method in printing, 15.
- Seedling anatomy of *Ricinus* (Thomas), 49.
- Seeds of Marsh Orchids (Dymes), 48.
- Sewell, Major R. B. S., el. 13; prop. 6; second reading, 7.
- Shackleton-Rowett Exped. (Wilkins), 8.
- Sherrin, W. B., volumes of mosses, 9.
- Sikkim orchids, method of colouring plates, 16.
- Silica in plants (Walsh), 18.
- Simpson, N. D., adm. 46.
- Smith, H. H., el. 17; prop. 13; second reading, 14.
- Solander, D., fatal seizure, 5.
- Solomides, Z. I., el. 6; prop. 1; second reading, 3.
- Sophora tetraptera* var., on Gough Island, 8.
- Sparrman, A., *Forstera*, 2.
- Sphagnum*, book of specimens shown (Sherrin), 9.
- Spitzbergen Lichens (Paulson), 11.
- Sponges (Ferrer), 14; from Abrolhos Islands (Dendy & Frederick), 49.
- Sprague, T. A., el. Councillor, 23; on twin-leaves of Ash, 4.
- Statospores of Diatoms (Yermoloff), 10.
- Strobilus theory of Angiosperm Descent (Parkin), 14; — abstr. 51-64.
- Succulent plants preserved, 46.
- Summerhayes, V. S., Lichens coll. by, 11.

- Swynnerton, C. F. M., African forests, 13; withdr. 22.
Syndendrium, Ehrenb., 10.
- Tabor, R. J., el. Councillor, 23.
 Tendril of vine bearing a grape, 2.
 Thomas, Dr. E. N. M., seedling anatomy of *Ricinus*, 49.
 Thomas, H. H., on Parkin's paper, 65.
 Thompson, H. S., withdr. 24.
Thorea ramosissima, Bory, unique British specimen, 9.
 Tierney, Dr. C., adm. 21; el. 17; prop. 13; second reading, 14.
 Tillyard, Dr. R. J., wing-venation of Mayflies, 5; — postponed reading, 5.
 Tippet, Rev. W. C., el. 48; prop. 17; second reading, 19.
 Transvaal Leguminosæ (Burt-Davy), 47; — abstr. 66-68.
 Treasurer's Annual Report, 21, 24-26.
 Trees, giant, of Victoria (Peirce), 6.
 Tristan da Cunha, plants on, 8.
 Troup, Prof. R. S., adm. 46; el. 13; prop. 9; second reading, 11.
 Tussock grass on Gough Island, 8.
 Tyrol, plants from, 13.
- Vaillant's orchids, 4.
 Van der Bijl, Dr. P. A., withdr. 22.
 Velaminous roots in orchids (Moss), 47.
 Vice-Presidents appointed, 46.
- Victoria, giant trees of (Peirce), 6.
 Vine-tendril bearing a grape, 2.
 Visitors' book recording weights, 5.
- Wales, Desmids from, 11.
 Walker, A. O., Vine-tendril bearing a grape, 2.
 — congratulations to, 2; letter from, 3.
 Wallace, Prof. R., withdr. 22.
 Wallflower, its early anatomy (Scott), 50.
 Walsh, Lt.-Col. J. H. T., silica in plants reduced by moulds, 18.
 Watson, Prof. D. S. M., & E. L. Gill, Palæozoic Dipnoi, 6.
 Weiss, Prof. F. E., el. Councillor, 23.
 Wilkins, G. H., 'Quest' collections, 8.
 Wilkins, W. H., adm. 21; cert. read, 1; el. 6.
 Williams, F. N., death, 22; obituary, 45.
 Wilmott, A. J., *Orchis latifolia* from Öland, 3.
 Wilson, E. A., adm. 15; el. 13; prop. 7; second reading, 9.
 Wolfenden, Dr. R. N., withdr. 22.
 Woodland formations in Africa, 13.
 Woodward, Dr. A. S., Address, 35; app. V.-Pres., 46; el. Councillor, 23; Linnean Medal presented by, 33.
- Xanthiopyxis*, Ehrenb., 16.
- Yermoloff, Sir M., *Chatoceros*, 10.

